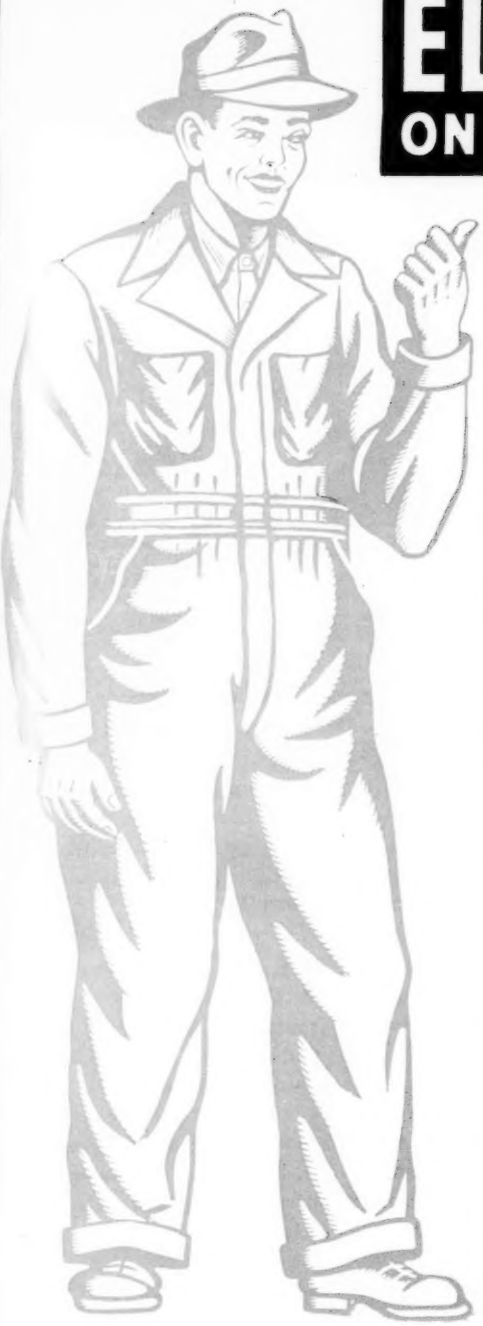


ELECTRICITY ON THE FARM Magazine

1948 COVERALL ISSUE

AUGUST-SEPTEMBER

21st Year . . . . No. 7

Contents

SECTION		PAGE
1	How to Use This Handbook	7
2	Electric Service in the Country	7
3	Safety With Electricity	8
4	Costs and Returns	9
5	Homemakers' Electric Equipment	12
6	Farm Wiring and Control Devices	22
7	General Farm Uses for Electricity	24
8	Milk Production	36
9	Poultry Production	40
10	Honey Production	45
11	Light; Infrared; Ultraviolet	45
12	Motors, Controls and Protection	50
13	Refrigeration and Cold Storage	52
14	Shop Equipment	54
15	Water Irrigation—Water Heating	58
16	Fruit, Flower and Vegetable Production	64
	Index	4-5

A CASE-SHEPPERD-MANN PUBLICATION

Here's Joe Wildermuth making the last weld on the picker. This was just one of more than 40 different jobs the Welder did for the Wildermuths in the first six months they had it.

...the money-saver

JOE WILDERMUTH HAD A STREAK OF BAD LUCK LAST YEAR. Right in the middle of the corn-harvesting season on the Wildermuth Place, Akron, Ind., the snapping rolls and gathering snout on the corn picker broke in several places.

But, being modern farmers, the Wildermuths were ready for this trouble. Their General Electric Farm Welder put the machine back in shape with little expense and minimum delay.

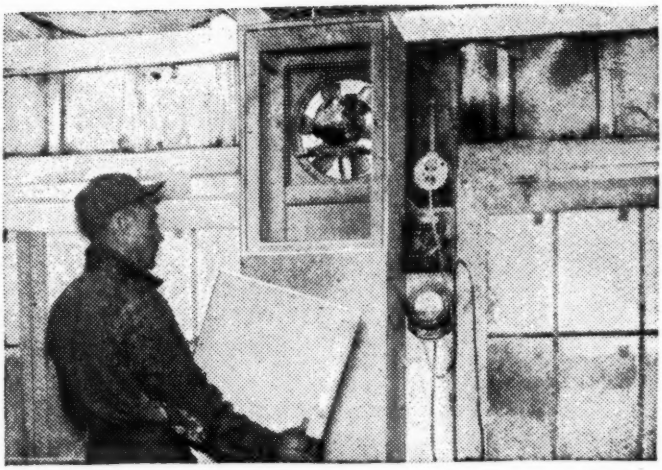
"We rushed the picker back to the barnyard, I put on my welding helmet and gloves, and had it fixed, strong as ever, in a short time," says Joe. "We keep a very close watch on profit and loss on our 380-acre hog and sheep farm. And, that's why we're so satisfied with our G-E Welder. No repair bill to pay for the first-rate mending job I did. No expense at all other than the small amount of electric current and the few G-E electrodes I used."

"Didn't lose much time, either," Joe went on to say, "and that's the same thing as money to a farmer in harvest time. There was no waiting around while broken parts were carted to town for repairs."

This farmer's experience is typical of those reported from all over the country by farmers who have discovered dozens of ways to save time, money, and drudgery by using G-E Farm Welders.

Compact in construction, built to give maximum protection to the operator, and designed ***specifically*** for use on rural lines, this welder meets NEMA and REA specifications and is listed by the Underwriters' Laboratories. Your local G-E Farm and Home Dealer has a complete stock of G-E Farm and Home Welders and accessories. See him today for complete information. ***Farm Industry Div., General Electric Co., Schenectady, N. Y.***

GENERAL ELECTRIC



Electric poultry house ventilation saves you time and money!

SAVE yourself a lot of work changing litter this winter by installing an electric ventilating system. Proper ventilation keeps air and litter dry. Saves you the time and expense involved in frequent litter changes. Start now to build up deep litter to assure a warm floor in your poultry house. Install a small electric fan and homemade intakes to remove moisture and provide fresh air.

Ask any Niagara Hudson Farm Service Representative or your County Agricultural Agent for details of a simple electric ventilating system that you yourself can install.

BUFFALO NIAGARA ELECTRIC CORPORATION
CENTRAL NEW YORK POWER CORPORATION
NEW YORK POWER & LIGHT CORPORATION

NIAGARA HUDSON

Index of This Issue

	Page
Accumulators, steam	39, 63
Air compressor	54
Air conditioner	12
Alarms	24
Attic ventilating fans	14
Bactericidal lamps	44
Barn cleaners	36
Barrel loader	64
Battery chargers	54
Bee culture	45
Belts	55
Blankets, electric	12
Blender	12
Blowers, ensilage	36
Blowers, hay	28
Blowers, furnace	30
Books on wiring	24
Bottle warmer	12
Brazing	58
Broiler, barbecue	12
Broiler, table	12
Brooders, chick	40
Brooders, pig and lamb	31, 32
Burners, oil	31
Burr mills	27
Caponizing instrument	40
Casserole	12
Cereal cutter	27
Certified lamps	47
Chlorinators	62
Churns	36
Cleaners, barn	36
Cleaners, dropping board	40
Cleaners, vacuum	20
Clippers	20, 24
Clocks	12
Clothes drier	12
Coal stokers	30
Coffee grinder	12
Coffee makers	12
Cold cathode lamps	47
Cold storage	53
Combination electric ranges	18
Compressors, air	54
Compressors, refrigeration	52
Communication systems	24
Concrete mixers	26
Controls, electric	24, 48
Controls, heat	30
Conveyors, farm	26
Conveyors, poultry litter	26, 40
Coolers, egg	41
Copper tube water delivery	61
Copper tubing	60
Corn and cob crusher	24
Corn and grain drying	24
Corn popper	12
Corn sheller	26
Cost of electricity in U. S.	9, 10
Cost of living in U. S.	10
Cost of pumping	60
Crop driers	29
Curing tobacco	32
Cutters, green feed & litter	40
Cutting benches	64
Dairy, electricity in the	36
Debeakers	40
Dehumidifier	12
Dehydrators, fruit, veg. hop	64
De-icers for stock tanks	61
Desert air cooler	12
Dishwasher	14
Door chimes	14
Drag saw	36
Dressing plants, poultry	41
Driers, corn and grain	24
Driers, hay	28
Drills	55
Drinking cups for cows	61
Dropping board cleaners	40
Egg cleaners	41
Egg cookers	14
Egg coolers	41
Egg graders	41
Electric eyes	24
Elevators, farm	26, 41
Elevators, poultry house	41
Ensilage cutters	26, 36
Equipment costs	10
Evaporators	52
Evaporative coolers	12
Extractors, honey	45
Facts on use of electricity	7
Fans	14
Fanning mills	28
Farm lighting design	45
Farms having electric service	7
Feed grinders	26
Fence, electric	26
Finishers, hay	28
Fire protection	59
Fish fence	62
Fluorescent lamps	47
Fly traps and screens	28
Foot warmer	14
Forced air circulation	30
Forge	56
Freezeless stock tank	61
Freezer-lockers	14, 53
Freezers	14, 53
Friction of water in pipes-table	60
Frost prevention	65
Frostproof hydrants	61
Fruit & vegetable graders	64
Fruit & vegetable production	64
Fruit dehydrators	64
Fruit washers	64
Fuses	24, 53
Garbage disposer	14
Generation	7
Germicidal lamps	44, 49
Germinating benches	64
Graders, egg	41
Graders, fruit and potato	64
Grain treaters and cleaners	28
Green feed cutters	40
Greenhouse heating	65
Grill, table	14
Grinders, feed	26
Grinders, tool	56
Hair drier	14
Handbook on Farmstead Wiring	24
Hammer mills	27
Hay blowers	28
Hay driers	28
Hay finishers	28
Hay hoists	28
Haymakers	29
Heat controls	30
Heaters, portable	17, 37
Heaters, water	22, 40, 62
Heat in greenhouses	65
Heat in milk house	37
Heating pads	14, 17
Heat lamps	37
Heat pumps	30
Hedge trimmers	31
Hive heaters	45
Hoists for milk cans	37
Hoists, hay	29
Homemade equipment	10
Honey extractors	45
Honey heater and bottler	45
Honey liquifier	45
Hop driers	64
Hotbeds	65
Hot plates	17, 63
House heating, electric	30
Humidistats	24
Hydrants	61
Ice cream freezer	18
Immersion heaters	63
Incandescent lamps	46
Incubators	42
Infra-red	49, 65
Insect repellent lamps	48
Instantaneous water heat	63
Interruptions	8
Iron, electric	18
Ironer	18
Irrigation pumps	62
Jet heat	30

ELECTRICITY ON THE FARM *Magazine*

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GEORGE W. KABLE, *Editor*
KENNETH V. ANDERSON, *Asst. Editor*
NAN SHAW, *Housekeeping Editor*
K. H. GORHAM, *Business Manager*

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	Page
Keeping pipes from freezing	61
Kinds of service	7
Knife sharpener	18
Kitchen ventilator fan	14
Knives, uncapping	45
Lamb brooders	31
Lamps, shapes, sizes, bases	46
Lathes	56
Lawn mowers	31
Light	45
Lightning protection	9
Lights for egg production	42
Lights for fattening hogs	32
Light traps for insects	66
Lighting design	45
Lighting economics	48
Line costs	9
Litter conveyors	26, 40
Livestock water warmers	61
Liquifier, honey	45
Load center metering	22
Lockers, farm freezer	14, 53
Low voltage	8
Milk coolers	38
Milk pasteurizers	39
Milkers	38
Milkhouse heating	37
Mixers, concrete	26
Mixers, feed	27
Mixers, kitchen	18
Motors, choice of	51
Motors, farm types	50
Motors, reversing	51
Motors, sewing machine	20
Motors, starters, protection	51
National Electric Code	8, 24
Night light	18
Oil burners	31
Packaging freezer foods	20
Pail heaters	63
Paint sprayer	56
Pasteurizers	39
Pickers, poultry	43
Pig brooders	32
Pipe friction	60
Pipes, to keep from freezing	61
Portable motors	56
Poultry dressing plants	41
Poultry pickers	43
Poultry farm uses	40
Poultry protection	42
Poultry water warmers	61
Pour-in heaters	63
Power troubles	8
Pressure switches	24
Pulley speeds and sizes	55
Pumps, types	59
Radiant heat	30
Radiators	17
Radios	33
Range, electric	18
Rates	9
Reflectors, shades, etc.	46
Refrigerating machines	52, 53
Refrigerators, household	18
Returns for using electricity	10
Roasters	18
Roller Mills	27
Rural service	7
Rural service men	8
Saws, table, bench, hand, hack	56
Saws, wood	36
Scalders	43
Scissors, electric	20
Screens, fly	28
Sealing tools	20
Separators	39
Service entrance	22
Service, kinds of farm	7
Sewing machines	20

	Page
Sewing machine motors	20
Shaver	20
Shears, sheep	33
Shellers, corn	26
Shop, farm	54
Showers, cabinet	62
Silo unloader	39
Soil heating	66
Soldering	58
Speed reducers	56
Speeds and sizes of pulleys	55
Splitter, wood	36
Sprayers, fly	28
Spray rigs, greenhouse	66
Stand by generators	8
Stationary spray plants	66
Statistics on use of elec	7
Steam accumulators	39, 63
Steam irons	18
Steam radiators	17
Sterilamps for poultry	44
Sterilization, soil	66
Sterilizers, milk utensil	39
Stokers, coal	30
Sump pumps	60
Sunlamps	44, 48
Table saws	56
Tea kettle	20
Telephones, farm	24
Television	32
Thawing time	53
Thermostats	24
Three wire service	22
Time clocks	12, 43
Timers	20
Time switches	43
Toasters	20
Tobacco curing, grading	32
Tool grinders	56
Tools, power	56
Transmission, electric	7
Traps, fly	28
Traps, light for insects	66
Treatment of water	62
Ultra-violet	44, 48
Ultra-violet for poultry	44
Uncapping knives, honey	45
Underwriters laboratories	9
Unloader for silos	39
Utensil sterilizers	39
Vacuum cleaners	20
Vacuum groomers	36
Vaporizer	12
V belt drives	55
Ventilation, dairy stable	39
Ventilation, poultry houses	44
Waffle bakers	22
Wagon unloaders	33
Walnut dehydrators	64
Walk-in refrigerators	53
Washers, fruit	64
Washer, portable	22
Washing machines	20
Water circulators	31
Water heaters	22, 40, 62
Water tank size	59
Water pipe	60
Water pumps	59
Water requirements per farm	58
Water systems	58
Water treatment	62
Water warmers	61
Waxer	22
Waxers, poultry	44
Welders	57
Well drillers	36
What is it worth	10
Wiring	22
Wood saws	36
Wood splitter	36
Yard Lights	48
Yard light controls	48

INDEX OF ADVERTISERS

	Page
Alabama Mfg. Company	60
American Sewing Machine Co.	65
Aurora Pump Company	62
Babson Bros. Company	Back Cover
Belle City Appliance Co.	64
Berkeley Pump Co.	11
Black & Decker Mfg. Co.	56
Blizzard Mfg. Company	63
Booms Silo Company	56
W. R. Brown Corp.	44
Century Electric Co.	33
Clark Division, McGraw Elec. Co.	Inside Back Cover
Cleveland Quarries Co.	27
Crane Company	13
Crown Barn Division Marathon Elec. Co.	37
De Bothezat Fans Div. American Mach. & Metals, Inc.	50
DeLaval Separator Co. (Food Freezer)	16
DeLaval Separator Co. (Milker)	17
Deming Company	45
Eagle Mfg. Company	43
Eau Claire Equipment Co.	59
Electro-Therm, Inc. (Room Heaters)	32
Electro-Therm, Inc. (Water Heater)	38
Erickson Electronic Sales	55
Fairbanks, Morse & Co.	25
Flinchbaugh Company	65
Flint & Walling Mfg. Co.	36
Frigidaire Div., Gen'l, Motors	15
General Electric Co. (Lamps)	21
General Electric Co. (Welders)	Inside Front Cover
Goulds Pumps, Inc.	39
Gro-Quick	65
Guard-It-Mfg. Co.	66
Hamilton Beach Co.	19
Hanover Lighting Sales Co.	62
Harder Freez Division Tyler Fixture Corp.	46
Heil Company	51
H. D. Hudson Mfg. Co.	57
Hughes Copper Connectors	65
ILG Elec. Ventilating Co.	47
Indus. Elec. Mfg. Co.	52
Int'l Electric Co.	56
Int'l. Harvester Co.	23
Int'l. Register Co.	54
IXL Pump & Mfg. Co. Inc.	57
Jack & Heintz Precision Indus.	55
Jacobsen Mfg. Co.	58
Lincoln Electric Co.	49
McDowell Mfg. Co.	64
Malleable Iron Range Co.	51
Milwaukee Equipment Co.	44
F. E. Myers & Bro. Co.	40
National Enameling & Stamp. Co.	31
Norge Div., Borg Warner Indus.	30
Oshkosh Filter & Softener Co.	40
Peerless Pump Division	52
Permutit Company	28
Pickwick Company	58
Rexair Division, Martin Parry Corp.	48
Richard Renner Associates (Hand Tools)	46
Richard Renner Assoc. (Elec. Repair Kits)	66
Rilco Laminated Prod. Inc.	42
Schaefer, Inc.	29
Security Mfg. & Cont. Co.	56
Shore Line Industries	65
Singer Sewing Machine Co.	41
Smalley Mfg. Co.	63
Smith Gates Corp. (Water Warmers)	37
Smith Gates Corp. (Thermotape)	61
Speedway Mfg. Co.	66
Sunbeam Corp.	49
Tokheim Oil Tank & Pump Co.	41
Trindl Products Ltd.	44
Union Insulating Co. Inc.	59
Victor Products Corp.	53
Joseph A. Vogel Co.	63
Waters Conley Co.	63
Westinghouse (Appliances)	6
Westinghouse (Rural)	34-35
W. C. Wood Co. Ltd.	42
Woodford Hydrant Co.	43
Zero Mfg. Co. Inc.	54

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Section 1

How to Use This Handbook

THIS issue contains brief facts and figures on using electricity for many different purposes on the farm. The items are short. You may wish to read all of them from front to back. Or you can look at the Table of Contents on The Front Cover. Then read what interests you most. You will find many facts and suggestions that can help you save labor or make money.

Use a colored pencil. Mark those things you would like to do something about.

SAVE THIS HANDBOOK! You will probably refer to it many times during the year. In looking up specific subjects, turn to the Index on pages 4 and 5. It will save you much time. Some subjects are discussed in several places in the book. The index will tell you where.

Equipment prices are changing. Prices given are approximate only.

Section 2

Electric Service in the Country:

HIGH lines now serve 65 per-cent of all U.S. farms. Another 13 percent are within one-quarter mile of these high lines. Additional lines are being rapidly extended into new territory.

In areas beyond the reach of high lines, several types of small electric generating plants have been used. They include:

1. Gasoline or Diesel engine driven generators.
   32 volt direct current with storage batteries
   110 volt dc with or without storage batteries
   115 or 230 volt alternating current
   Combination 115-230 volt alternating current
2. Wind driven generators, usually direct current with storage batteries and under 2.5 kilowatts.
3. Water powered generators. (It takes a lot of water)
   Overshot wheels for falls of 5 to 16 feet
   Turbine wheels for falls of 5 to 60 feet
   Impulse wheels for high falls or heads of water

Kinds of High Line Service

Practically all farm service is of three kinds:

1. Single phase, 2 wire at 110 to 120 volts
2. Single phase, 3 wire at 110-220 to 120-240 volts. That is, two voltages, one double the other. The low voltage is for lights and small appliances; the high voltage for ranges, water heaters, motors, welders, etc.
3. Three phase

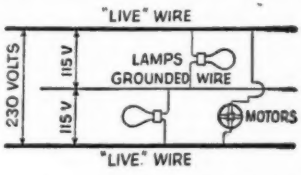
Generation and Transmission

Practically all large generating stations produce *three-phase* current. It is taken from the generators, stepped up to very high voltages (as high as 100,000 volts) for *transmission* over long distances. Where the electricity is to be distributed for use, the voltage is stepped down to 2300, 4000 or 6900 volts in a *sub-station*. These voltages (pressures) force the current out over your rural lines.

Three-phase current must have either three or four wires to travel over. Three-phase current is generally used only for larger motors and for heavy industrial load. It is used extensively in the West for irrigation pumping. Special motors and equipment are required.

Two wires of a three-phase circuit are used for a **single-phase** farm *distribution line*. Those two wires connect to a transformer at or near your farm. The *transformer* reduces the voltage to 115 volts and 230 volts for farm use.

Every 115 volt single-phase circuit of two wires has one of the wires connected to the ground at the transformer pole and at your entrance service. Every three-wire 115-230 volt circuit has one of the three wires (the neutral) connected to the ground at the transformer and at your service entrance. "Grounding" is for safety.



The illustration shows a three wire 115-230 volt circuit. There is 230 volts pressure between the two "live" wires. Between either

U. S. Farms Having High Line Service

	U. S. Total	*App. Percent*
Total farms in US (1945 Census)	5,859,169	
Farms having service Jan. 1, 1948	3,817,100	65
Farms within ¼ mi. of power line but not using service	789,300	13
(Census figures show this to be practically constant)		
Total farms to which power line service is available	4,606,400	78
Per cent of farms with service available that are not using it (789,300 divided by 4,606,400)		17
Farms not reached by power lines	1,252,769	22

"live" wire and the grounded wire, 115 volts pressure.

Farm Power Troubles

There are two troubles you may have on any power line. One is power interruptions; the other low voltage.

Power interruptions are unavoidable at times. The power may have to be cut off to make plant or line repairs. Customers are usually notified in advance. Wind, ice, tree branches, automobile wrecks, or lightning may break down the line, sub-station, or transformer. Thoughtless people may break insulators on poles with rifle or slingshot. Except in great catastrophies, repairs are usually made quickly. Watch your section of line for trees or branches. If an interruption occurs find out if your neighbors are affected. If they aren't, check your fuses. If your fuses are all right and you still have no electricity, phone your power distributor. It is wise to advise him in advance if you have incubators or brooders operating. He will do his best to keep service coming.

Low voltage occurs on many lines. The first place to look for the cause of low voltage is in your own farm wiring. If you have added motors, heaters, electric irons or a range since your wiring was put in, the wires may be overloaded, or your transformer may be too small for the added load. Other causes may be new customers added to your farm line, or a building up of the load on all of the farms. That may overload the entire line. It is costly to replace wires and transformers. Materials have been scarce. Low voltage conditions on lines are usually being corrected as fast as economically feasible. Discuss the matter frankly with your local office if you are having difficulty.

Stand-By Generators are available for hospitals, hatcheries and wherever current interruptions might cause great loss. Most elaborate are completely automatic gas or diesel plants which may be cut in quickly if the power goes off. Self-regulating generators may also be obtained for tractor or gas engine operation. They come in 115 v, 230 v, or combination 115-230 v alternating current machines. Remember that some motors, heaters and other equipment designed for alternating current will not run on direct current such as produced by small lighting plants. Be sure the generator operates at the same number of cycles as your equipment (usually 60 cycles).

Rural Service Men

Rural Service Men are employed by many power suppliers. Some are salesmen. Some sign up customers. Some are employed just to help you with your problems of wiring and using electricity. Many of these men are agricultural engineers who know local farming and know electricity. They can often help you a lot in selecting and installing equipment, finding labor saving methods, telling you of new developments, getting you on the right rate, and even showing you how to save on your use of electricity. A number are farm boys with a lot of good, common sense. You can lose nothing, and you might gain much by making their acquaintance.

Section 3

Safety with Electricity

ELECTRICITY can be dangerous. So can a mule, a match, a pitchfork or a stairway. Learn how to use them safely and they will not kick back. One is as safe as the other.

Pointers on Using Electricity Safely

1. Wire to the standards of the National Electrical Code. Any reliable wireman will have this code. Most cities follow it with some additions. Its safety requirements are generally accepted. Have your wiring inspected by a competent inspector. It may cost $5. It may save hundreds.

2. Avoid unsafe, homemade additions to good wiring. That is where much trouble comes from.

3. If you add more equipment, be sure your wiring will carry it. Have it checked. You may have to replace wires if they are too small.

4. Beware of multiple plugs in convenience outlets. Outlets and circuits are made to carry certain loads. If overloaded, the wires or outlets can set fire. Multiple plugs also invite short circuits which can set fire, injure children, etc.

5. Criss-crossed, worn extension cords laid over or under inflammable carpet, and furniture is positively hazardous. Never lay or fasten an extension cord or other electric wire over or to a metal pipe, engine, windmill tower or stanchion. Many cows have been killed that way.

6. Lamp sockets are intended for lamps—not appliances. The metal and insulation in lamp sockets is designed for only light loads. Electric irons, roasters, etc. may eventually cause shocks or fire. Furthermore the iron or roaster may not develop its full heat when plugged into a lamp socket.

7. Keep motors and motor driven equipment cleaned, oiled and repaired.

8. If you get a shock from wire or appliances, something is wrong. Find the trouble and have it repaired. Shorts or leakage currents may give serious shocks to humans or kill cows.

9. It is a good safeguard to insert a 6" piece of heavy rubber tubing in the pipeline from your milking machine vacuum pump to the stanchions. Motors or wiring sometimes develop leakage currents which will kill cows. This rubber tube will keep the current from being carried down the pipeline to the stanchions.

10. Avoid homemade electric fences. Homemade fence controllers have killed many cows and quite a few humans. They are dangerous.

11. Never touch electrical appliances when you are in the bathtub or have one hand on water

piping or faucets. Watch this particularly where radiant heaters are used in bathrooms.

12. In replacing burned-out fuses, use the same size. Fuses are safety valves for your wiring. Overfusing or putting pennies behind fuses is in the same class with throwing away your life-preserver when you are in deep water and can't swim.

13. Do not hang tools, rags or anything else on electric wires.

14. Avoid overhead wires when pulling well pipe, riding hay wagons.

15. The U.L. label on a piece of electrical equipment means that it has been tested for safety and approved by the Underwriters Laboratories Inc.

16. Electricity is used safely by millions. Accidents are not the fault of electricity (or pitchforks). They are the fault of people who are careless; who do not think. THINK!

Lightning Protection

Lightning does strange and unpredictable things. Your electric wiring system will not protect buildings from lightning.

The best protection from lightning is properly installed lightning rods, conductors and *grounds*. "Know how" is necessary. Placing of rods, connecting metal roofs, hay tracks, vent stacks, and installation of grounds are important. Excellent bulletins are available on the subject. The Underwriter's Laboratories have a "Code for the Protection Against Lightning". Reliable companies will now make "Master Label" installations which must have the approval of Underwriter's Laboratories for acceptance.

It is well to ground woven or barbed wire fences, especially at points where livestock may congregate during storms.

Section 4

Costs and Returns

Costs of electricity to the farmer include line costs, monthly electricity bills, equipment costs and repairs and upkeep.

Returns from using electricity include (1) labor saved; (2) money saved or made; (3) personal satisfaction and pleasure in living; (4) better health; (5) inspiration to improve other methods.

Line Costs

In the early days of farm lines, those served paid part or all of the cost of lines built to serve them. As rural service demonstrated its feasibility, lump-sum payments softened into monthly service charges. Service charges have become lower and lower. Many power suppliers now have no service charges. In some places they just require you to pay for a specified amount of electricity each month. That amount depends on the cost of the line, the size of your load or transformer, or may be an average amount for the area. All line charges, service charges and minimums must have the approval of State Public Service Commissions except in the case of some co-ops.

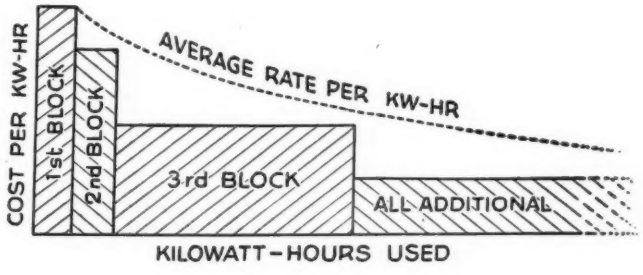
Farm Rates

Farm rates vary widely throughout the United States. They depend on cost of coal, labor, dams, power plants, distribution facilities. The length of transmission lines are a factor. Rocks, trees, and hills govern pole-line costs. Most important of all is the amount of electricity used in a given area. The more used, the less the cost.

The form of the rate also varies widely. Some rates include a service charge plus a kilowatt-hour charge. Some just specify a monthly minimum. Practically *all rates are on a sliding scale*. The more you use, the less the cost per kw-hr. This is important to you! The added kw-hrs you use cost less. For that reason it might be cheaper to brood chicks, heat water, cook your food with electricity than with some other source of heat.

Special rates are offered by some suppliers for special uses. Off-peak rates are those offered during certain hours of the day when the demand for electricity is low. An electrically operated time switch cuts the equipment off at other times. Such rates usually apply to water heaters. One farm may have two or more different rates.

In general, farm rates are among the lowest retail rates offered by suppliers. They are usually lower than for stores or small industries like feed mills or hatcheries.



Typical sliding scale or "block" rate. The height represents the cost of each kw-hr. The distance along the base represents the number of kw-hrs in each "block." Note that each block is at a lower rate. The dotted line gives the average cost per kw-hr for any number of kw-hrs used. Actual rates are omitted because they vary. You can construct a similar diagram from your own rate card. Have your 4-H boy do it. Note that the more electricity you use, the less it costs per kw-hr.

Usually the first rate block covers lights. The second block covers small appliances like fans, toasters, a shop motor. The third block covers your water system, iron, milkers, refrigerator, etc. The low block is for cooking, water heating, brooding and other additional load.

When a farm becomes a rural industrial plant (retail milk distributor, hatchery, etc.), some suppliers require the payment of the same rates as similar industries pay in town.

Some companies make extra monthly service charges for large motors, welders or equipment that requires larger generators, wires or transformers.

Be sure you are on the lowest rate available to you. Discuss it with your rural service man.

Equipment Costs

In equipment costs you must consider, first cost, operating cost and cost of upkeep and repairs.

Which is the best refrigerator or brooder? There is no *one* best. What are you most interested in? Size? Finish? Mechanical construction? Durability? Operating cost? First cost? Reliability? Service when needed? The low priced unit may suit you best. The one with many gadgets pleases Bill. Sue wants the one that just fits the space she has.

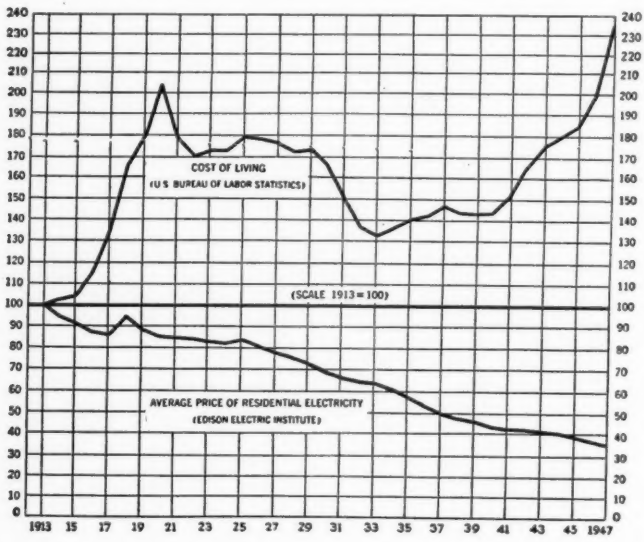
It is a pretty good plan to list what YOU want in a piece of equipment. Select a manufacturer in whose equipment you have confidence. Then buy from a dealer who is reliable and will be on hand when you need any service or repairs. Buy the model that fits YOUR requirements.

Homemade equipment is used on many farms. New kinds of equipment are nearly always made first on farms. Later manufacturers build them. Some farmers are good enough mechanics to do as good a job as a factory. Generally speaking, the factory-made equipment is better and safer. It may also be less costly in the end. You must be the judge of your own ability.

What should we buy? is a question each farm must answer for itself. No farm can support or should buy all the electric equipment that is available. Some things are advantageous for one farm but not for another. The cost and operating expense of equipment must be balanced against the returns it brings.

It is also good judgment not to go heavily in debt for equipment when prices are abnormally high unless you are sure that your future income will retire the debt.

If you have the cash, that's different. What you buy with the cash is a matter of what will give you the greatest satisfaction.



These curves tell a story worth noting. As the cost of living has gone upward, the cost of electricity has been steadily downward. Farm rates closely approximate the residential trend.

What Is It Worth to Me?

Many past issues of ELECTRICITY ON THE FARM have carried this

Rule for Evaluating Equipment: **Put dollar values on the estimated yearly benefits of an investment. Subtract any added costs. Divide this net gain by the percent which must be charged each year for interest, upkeep and depreciation and you will have approximately what the equipment will earn for you. If this is more than its actual cost, the difference will be your gain.**

Example: What is a Feed Grinder Worth?

As a basis for this estimate we will assume a herd of 25 cows producing 15 pounds of milk per cow per day (less than 1 gallon per milking). They would consume 45,000 lbs. of mash per year. Also 200 hens using 6,000 pounds per year. We will also assume that the time and labor of loading and hauling to the mill just about balances the time and labor of grinding. With a well planned installation, the grinding will take less time. If you make one trip each week to the mill 5 miles away the gas will cost about $10.40 per year. Allow nothing for oil, tires and wear on car. We will assume you pay 15c per cwt for grinding at the mill and 2c per cwt for electricity to grind at home. We will "lean over backwards" by allowing nothing for time you wait at the mill or for the extra value of freshly home-ground feed.

Savings with Mill

Grinding cost 510 cwt @ 15c	$76.50
Gasoline for year's hauling	10.40
	$86.90
Less Electricity—510 Kw-hrs @ 2c	10.20
Saving	$76.70

Fixed Annual Costs

Interest	5%
Depreciation	8%
Upkeep	1%
Total	14%

$76.70 divided by 0.14 gives $548 as the investment which would be warranted. Substitute your own grinding figures in the formula and you can find out just what *you* will be justified in investing in a grinding outfit.

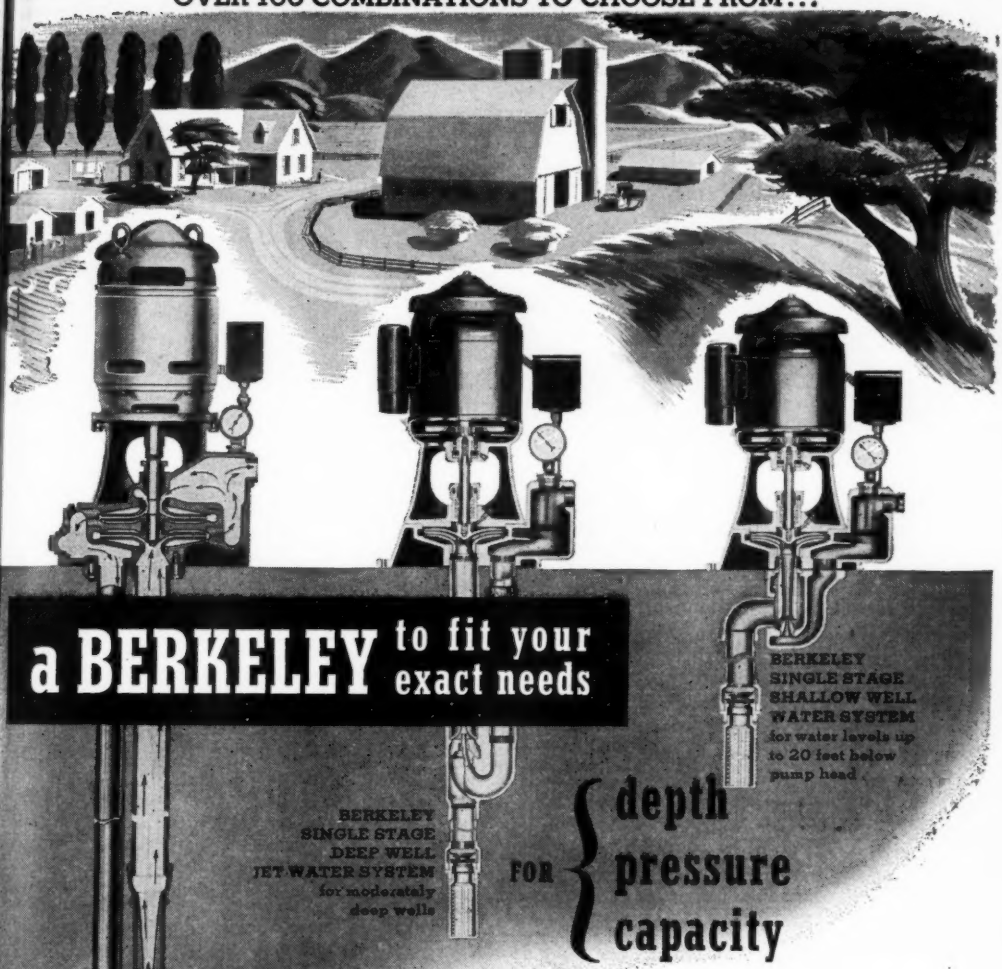
Returns for Using Electricity

Perhaps the greatest return from using electricity is the personal satisfaction and pleasure it gives. Some say its chief value is in keeping the young folks interested in, and proud of, the farm.

Without elaborating at length, let me point out a few specific and measurable returns.

A milking machine may save a hired hand; a hay hoist an extra

OVER 100 COMBINATIONS TO CHOOSE FROM...



a BERKELEY to fit your exact needs

BERKELEY SINGLE STAGE SHALLOW WELL WATER SYSTEM for water levels up to 20 feet below pump head

BERKELEY SINGLE STAGE DEEP WELL JET WATER SYSTEM for moderately deep wells

FOR { depth / pressure / capacity

BERKELEY TWO STAGE JET TYPE DEEP WELL WATER SYSTEM for high capacity at great depths

You can choose a BERKELEY Water System with full assurance of dependability and with the knowledge that experienced engineers—*pioneers of the modern jet system*—will figure out a combination best suited to *your* particular needs.

A water system is a vital investment in comfort, health and increased profits. Before you buy, consult your local BERKELEY Dealer. He will tell you just what type of system will do your job most dependably and most economically. Or write us direct for literature and the name of your nearest BERKELEY Dealer.

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horse and man at haying time. A water system saves much labor, improves health and sanitation, makes possible higher milk and egg production. Other labor savers are electric barn cleaners, tool grinders, corn shellers, feed and litter conveyors. Electric cooking saves fuel handling and wearisome hot kitchens in summer. It's clean.

The refrigerator and milk cooler save ice bills. That ice-saving will frequently pay the entire electric bill for the farm. The milk cooler also saves milk rejections. The electric hay finisher may add $5 to $10 per ton to hay value. Irrigation pumps have paid off farm mortgages.

Glance through this book for many other examples of labor saving, money saving, money making, better food and better product producing uses for electricity.

Section 5

Homemakers' Electric Equipment

Air Conditioner. There are room air conditioners which can give you a 24 hr a day supply of fresh, clean, cool, dehumidified air in one room.

The size you need depends on the room measurements, outside exposures and insulation.

There are window and floor models to choose from. Some are designed for double-hung or casement-type windows. $300 up.

Desert Air Coolers are used quite extensively in dry climates for room cooling. An electric fan draws outside air through a filter pad moistened with water. The evaporation of the water cools the air. The units are both commercially made and homemade.

Blanket. An electric blanket permits you to sleep relaxed because you set the control for your body comfort and remove the weight of extra blankets. Cold blooded folks, also those who have frequent aches and pains have found that electric blankets give them restful nights.

You plug them into convenience outlets. They have durable built-in controls for safety. Use less than 1 kw-hr per night. $40-$65.

Blender. A blender saves time in preparing diet dishes, baby foods, nourishing beverages, and omelets. They're ideal if you want fruit or vegetable health drinks with juice and pulp combined.

Those with impellers and glass containers fascinate youngsters. Poor milk drinkers will vountarily whip up milk drinks for between-meal snacks.

A blender is easy to clean. It will whip cream, small batters and meringue, pulverize coffee beans, and shave ice. $35-$40.

Bottle Warmer. For bottle fed babies, a bottle warmer saves time and bottles, and reduces possible overheating. Since it can be carried about easily it gives good 24-hr service in any part of the house.

A warmer with extra parts will allow the heating of baby foods, or medicated vapors for croup and colds. The same parts become useful for older family members and convalescents.

Barbecue Broiler. For anyone who likes the flavor of meats barbecued over an open pit, there is now a rotating broiler which can be plugged in anywhere. By means of a small motor, the skewered meat or fowl is self turned, self basted, and self cooked. $50.

Table Broiler. Table broilers have dome shaped chromium covers, heat indicators, and one or two heat selectors. May be plugged into any convenience outlet.

In those homes where doctor's orders specify all broiled meats, a table broiler can be a welcome appliance.

Casserole. Electric casseroles are miniature roasters. They are insulated, have cool base handles and heat control dials. You cook, and serve right at the table. They're used for one-dish meals, such as baked beans, potatoes, braised meats, stews, and soups.

They are perfect for buffet, porch, yard, and church supper hot dishes. $10-$15.

Coffee Grinder. Small electric grinders are available for producing the grind you wish.

Coffee Maker. There are many choices to be had in glass and metal coffee makers.

Automatic coffee makers will make the coffee without attention, then hold it at drinking temperature. Good for early risers and those who like coffee before and after chores or long marketing trips.

Clock. You can depend on constant reliable time from an electric clock. There are good looking alarm, mantel, and wall clocks of conventional size. Wall clocks with larger numbers are made for barns or machine shops. Some clocks can also start a plugged-in appliance or radio at a selected time. The operating costs of electric clocks are negligible. $6-$25.

Corn Popper. Home models are many and varied. Some of them have glass covers, too, so you can watch the popping. $4-$10.

Clothes Drier. Clothes driers have become popular quickly. They take the uncertainty out of wash day and leave clothes fluffy dry.

Sorted clothes are tumbled about in heated air until only slightly damp for immediate ironing, or completely dry for storing. Drying time depends upon weight of load, kind of fabric, dryness, and outside humidity.

It is important to install a drier in a room where moisture can be removed easily. This can be good cross ventilation, an exhaust fan or an exhaust pipe. A drier will extract about 8 pints of water an hour.

Special wiring is necessary. Home driers use around 4.5 kilowatts. Cost similar to washers.

Dehumidifier. For any home with high humidity in basement, or storage areas, there are dehumidifiers. They need only a convenience

A Complete CRANE water system includes PUMP, PIPING, PLUMBING FIXTURES

IN THE BATHROOM

IN THE KITCHEN

IN THE LAUNDRY

How Did I Ever Do Without My Crane Kitchen!

"When I think back on all that lifting, and all those extra steps . . ."

No more! Now this lucky lady has everything right where she wants it. *Water?* Those Crane *Dial-ese* faucets bring hot or cold at the barest touch of a finger. *Dishes?* There's room for them all in that big, deep basin . . . and on the broad double drainboards. *Rinsing?* Nothing to it with the convenient hose spray that reaches all corners of the sink.

With a Crane Bathroom, too, and a Crane laundry tub, any housewife is really set to *live.* Just as in the kitchen, everything is handy. And here, too, she has *Dial-ese* faucets.

Outdoors and in the barns, the man of the house finds Crane a real help, with running water for his stock and for cleaning up.

Are you enjoying all this comfort and convenience? If not, stop in at your Crane Dealer's next time you're in town. You may find it costs less than you think to have modern Crane plumbing for your farm and home.

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outlet for immediate and continuous action. The air is dryed as moist air is drawn by a fan over a series of condensing coils. Water is deposited in a container or drain. Clothing, mold, metal rust and corrosion, wood warping, and sweating of walls is reduced. $150.

Dish Washer. Completely automatic dish washers are great time, labor, health, and dish savers.

The dish washer performs best with automatically heated water at 150°; this temperature is too hot for dishpan hands. The bacterial count on dishes done in a dish pan is 2½ times greater than dishes from a dish washer.

They come in complete sink combination, or separate units with push button, lever or dial operating control. You can get a model to load from the top or from the front. Most of them require special plumbing and electrical connections.

The water is automatically measured into the tub, then recirculated over the dishes for a set period of time. A soapless detergent is always recommended for dish washers. In a hard water area, automatic water softeners are recommended.

Some dish washers have an auxiliary heating unit for fast, complete drying of dishes.

Door Chimes. Door chimes are easy to install and service. Different note combinations can be had for different doors. Chimes can be had in choices of color, size, shape, metal and tone to fit into the furnishings of the house. $10-$25.

Egg Cooker. Egg cookers permit exact egg timing. Cook 1 to 4 eggs at a time in the shell. Can be used at the table. $5-$10.

Fans

Fan. A portable fan is no longer a summer item. It is useful all year long.

A fan's summer daytime job is first to stir the air and to exchange heavy humid air for fresh air.

In the winter a fan will direct heated air into cold spots in the house. It can also speed up the drying of clothes when hung indoors.

Fans help with rapid defrosting of refrigerators and freezers.

Available fan styles vary a great deal. Conventional type fans 6" to 24" in diameter have stationary and oscillating positions, adjustable heads, more than one speed, guards for blades and heavy padded bases for table, floor, or wall use. Some, without guards have rubber fan blades.

Pedestal fans have the features of the table types but can be adjusted from 2½' to 6' in height.

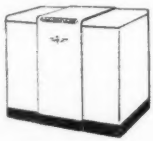
Then there are the floor **horizontal type fans.** These can be placed under tables and desks. They have excellent guard protection over and around the blades.

Kitchen ventilator fans are used for removing heat, steam and odors from kitchens. They may be permanently installed in outer walls, or at the top of kitchen windows.

Attic ventilation fans are of large size using ½ hp or larger motors. They are operated at night to exhaust the warm air from a house and draw in cool night air through the windows. The house remains cool longer during the day.

"But according to the attic fan booklet, shouldn't little black arrows be coming in the window?"

Food Freezer. A home freezer assures near at hand supplies of meat and other foods regardless of work schedules, weather, or roads. It makes it possible to rush quality fruits and vegetables from garden to winter storage with less work. You can capture and seal in more vitamins and minerals, too.



For complete freezer food service, with a possible refill twice a year, allow 5 to 6 cubic feet of storage space per person.

There are many models of the chest, upright, and walk-in types to choose from. Some families are using two and three small units rather than one large one. Other families use small freezers and supplement them with town locker service. Others have large walk-in units and are sharing them with fence line neighbors.

It is important to have some signal, either a light or bell, to notify you of any possible interruption in service. Also have an inside thermometer by which you can watch the readings so as to keep them as constant as possible. $300 up.

Foot Warmer. A foot warmer is a miniature 20-watt electric blanket. It has just one switch position. You turn it on a half hour before bed time and off when you get up. New. $8.

Garbage Disposer. Garbage disposer units come as part of an electric sink or can be installed under any sink having a 3½" drain opening. They require special electrical and plumbing connections.

Garbage is shredded fine while cold water is run through the drain opening. The septic tank will take care of the garbage if it is adequate in size.

Grill. A grill is another type of plug-in appliance for table cooking. It is especially suited to griddle cakes, frying bacon and eggs, making toasted sandwiches, etc. Particularly convenient for porch breakfasts and suppers.

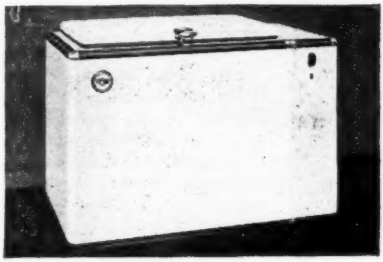
Hair Drier. Heat controlled electric hair dryers are used for many jobs other than getting family heads dry.

A drier will hasten the drying of nail polish or small touch up paint jobs. It will warm up cold veterinary instruments, speed up defrosting, hasten the drying of photographic prints, dry hands and bodies. $8.95 up.

Heating Pads. Heating pads are for spot heat application to the body. Equipped with safety thermostats, and at least three heat positions, a heating pad can be a

THIS MONTH'S CATALOG OF

FRIGIDAIRE PRODUCTS FOR THE FARM



EIGHT BIG CUBIC FEET OF HOME FREEZER CONVENIENCE

Frigidaire's Model HJ-8B Freezer brings new order, new convenience to frozen foods storage. Two roomy, sliding storage baskets above the bulk storage area below make everything in the freezer easy to reach quickly. Permanent freezer shelf for the fast freezing that means tastier foods. Other models—up to 26 cu. ft. capacities.

MAIL THIS COUPON FOR FULL INFORMATION

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Gentlemen: Please send me further information about the Frigidaire products checked below:

☐ Frigidaire Refrigerators ☐ Home Freezers
☐ Electric Ranges ☐ _____ (Other)

Name _____

P. O. Pox _____ *RFD*_____

*City*_____ *State* _____

NEW DE LUXE MODEL FRIGIDAIRE REFRIGERATORS

SPACE APLENTY in the big, full-width Super-Freezer Chest for storing frozen foods at extra-low temperatures. Model shown has four Frigidaire Quickube Ice Trays, one double-width.

LARGE FOOD COMPARTMENT — cooled partly by diffusion of cold air from Super-Freezer, partly by cooling coils concealed in back and bottom of cabinet. Result: less air circulation to dry out foods. Full-width, glass-topped Hydrator for fruits, vegetables. Aluminum Basket-Drawer.

DEPENDABILITY farm homes will welcome. Frigidaire's Meter-Miser is simplest refrigerating mechanism built. Sealed in steel, oiled for life, built for years of trouble-free performance.

FRIGIDAIRE DE LUXE REFRIGERATORS — Model illustrated: 9 cu. ft., DJ-9. Height 62 1/16", Width 33 7/16", Depth 27¼". Also available in 7 and 11 cu. ft. sizes.

←ONE OF THREE TYPES—NINE MODELS—TO CHOOSE FROM.

DOUBLE-OVEN FRIGIDAIRE ELECTRIC RANGE

A REAL KITCHEN "WORK-HORSE" — that lets you bake breads, cakes, pies in one oven at the same time you roast meats in the other. And Cook-Master Controls will automatically "mind" the large oven for you!

FAST, SAFE SURFACE COOKERY — with Frigidaire's Radiantube Units. 5 accurate heats on each for every sort of cooking task. Never a flame—and no fuel, no smoke, no soot, no ashes!

MODEL RK-70. 2 Even-Heat ovens, each with broiler. Triple-Duty Thermizer—combination deep-well cooker, baker and extra surface unit. Pressure cooker available as optional equipment. Full-width storage drawer. Sturdy cabinet, all-porcelain finish. Height (to cooking top) 36", overall height 49¾", width 40", depth 25½". Also, 6 other models.

YOU'RE TWICE AS SURE WITH TWO GREAT NAMES **FRIGIDAIRE**

MADE ONLY BY **General Motors**

SEE FRIGIDAIRE DEALER—or mail coupon for information about these products, or Frigidaire Electric Water Heaters, Automatic Home Laundry Equipment, Kitchen Cabinets, Sinks, Milk Coolers and "commercial" refrigeration equipment.

NOW! DE LAVAL BRINGS YOU A FOOD FREEZER

MADE ESPECIALLY FOR FARM USE!

The De Laval Speedway Food Freezer is not just another food freezer. It's made especially for farm use. It's brought to you by De Laval—a truly great name in *dependable* equipment.

This beautiful and economical freezer means garden-fresh vegetables *the year round*... luscious strawberries in mid-winter... meat, fish and game with their delicious flavors perfectly preserved... fruit as delicate and appetizing as on the sunny day it was gathered!

Yes, the De Laval Speedway Food Freezer means better farm living... better, more enjoyable table fare and perfectly balanced meals at far less cost. And it means an end to the old-fashioned canning season... with its hard work in a hot, steaming kitchen!

See De Laval Speedway Food Freezers today at your local De Laval Dealer... and you will agree that once again De Laval has brought you another great advance in farm living.

FOR THE AVERAGE FARM FAMILY...

Model F-100—Beautiful in appearance—convenient and economical to use. Its 16½ cu. ft. capacity holds up to 650 lbs. of assorted frozen foods. Interior of rust-proof aluminum—handy, cold-saver double opening type lids—movable interior dividers—gleaming white Dulux finish—"sealed unit" type compressor.

FOR THE LARGER FARM FAMILY...

Model F-200—Its 35 cu. ft. capacity holds up to 1350 lbs. of assorted frozen foods. Two double-sealed outer doors provide access to large freezing section and storage section consisting of three roller mounted locker drawers and three compartments having individual locker doors. This De Laval "inner-sealed" design conserves cold air and results in greatest economy. Large storage space on cabinet top for packaging materials.

A Famous Old Name on a Great New Product!

De Laval

The De Laval Separator Co.

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The De Laval Separator Company, Dept. 10-KLF
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Please send me printed matter on:

☐ Model F-100 SPEEDWAY FOOD FREEZER (16½ cu. ft.)
☐ Model F-200 SPEEDWAY FOOD FREEZER (35 cu. ft.)

Name_____

Town_____ RFD_____ State_____

wonderful dry application to everyday body aches, pains, chills, and cold feet. One should not go to sleep with it on. It should be used according to doctor's orders for a bed patient. For sanitary reasons it is wise to have one with a removable cover for easy washing. $6-$15.

Moist heat pads are now on the market. They have water reservoirs for 10 hours moisture supply. There is a small sinus or joint pad as well as a standard size. $5-$10.

Heaters, Portable

Portable electric heaters are used in the home to supply "spots" of heat where a person is working, or supplemental heat in bath rooms or other parts of the house.

Heaters are of several types. Most common is the **radiant heater** having a glowing heating element in the center of a metal reflector. It furnishes a spot of heat. Usually made in 660 or 1000 w size. Cost $5 to $10. **Fan type heaters** have small fans which blow air past the heating elements. This circulating warm air tends to warm the entire room. Made in wattages from 660 to 1320. Cost $12 up. **Electric steam radiators** look like steam radiators. They are light enough to be carried about. Inside of them is a small quantity of water with anti-freeze and an electric heating element. The water is turned into steam. These are suitable for room heating because they set up a circulation of warmed air. Thermostatically controlled. Around 1000 to 1320 watts. $25 and up. **Electric air radiators** look like the steam radiators but contain no liquid. They heat similarly and cost about the same. The above may all be plugged into convenience outlets; not lamp sockets.

Hot Plate. Inexpensive, table-top hot plates which plug into standard convenience outlets provide cool, clean cooking on hot days when a fuel range is intolerable. You will not get the speed, selected heats and low operating costs that are possible with an electric range. Place them on heat proof pads. Single and double units; between $10-$25.

Heavier hot plates require special wiring, have standard range units and heavy duty rotary switches for selected heats. These hot plates fill the needs for good surface cooking under restricted space conditions. There are one,

This "Magnetic Heart"

Beats out extra profits!

- Only De Laval Can Give You the *Magnetic* Milker
- Only the *Magnetic* Milker Can Give You *Uniform* Milking
- Only *Uniform* Milking Can Give You *Highest Milk Production*

"Now's the time for YOU to change to THE NEW DE LAVAL"

New De Laval Magnetic Speedway Milker

De Laval engineered for still better, faster, cleaner milking. New stainless steel unit and new Pulso-Pump.

New De Laval Sterling Milker

Another great new De Laval Milker for still better milking. Stainless steel units.

New De Laval World Standard Series Separators

The cleanest skimming, easiest-to-clean separators ever built. Every part milk touches is stainless steel. Hand or motor drive.

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165 Broadway, New York 6, N. Y.
Please send me printed matter on:

- ☐ De Laval Milkers
- ☐ De Laval Separators
- ☐ De Laval Freezers
- ☐ De Laval Water Heaters
- ☐ De Laval Milking Truck
- ☐ De Laval Can Hoist

Name.....
Town.....RFD....State.....

De Laval
THE DE LAVAL SEPARATOR CO.
165 Broadway, NEW YORK 6
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two, and three unit models from about $20 to $75.

Ironer. There are **flat plate ironers, rotating ironers** with both ends open and roll above the ironing shoe, and others with one open end and the roll underneath the shoe. An ironer permits one to sit down to iron. It will help get a lot of fine finished ironing done. Many ironer users boast of ironing on wash days. It will do about 85% of your ironing. You will still keep the ironing board and hand iron for some garments.

Always choose an ironer from a sitting position. Have a chair that gives your feet and back good support, and then see that you can reach all the controls without straining.

Different manufacturers offer special features. $65-$250.

Iron. Automatic irons with fabric-dial heat control take the guess work out of ironing. The modern irons of 1000 watts or more weigh between 2½ and 4½ lbs. This light weight saves a third of your energy. Such irons use about 40% less electricity. They also reduce "heat rot" and scorching of garments.

Each manufacturer personalizes his automatic iron with special features. For those who are left handed there are irons with cords that come out of the center back, or left of iron, or have a swivel ball connection. $11-$16.

Irons, Steam. If you want a professional finish to trousers, suits, and other finished garments or those in the making, a steam iron is a good standby appliance. Steam irons have large sole plates. Some are automatic and have fabric control dials. Some can be switched from steam to dry heat. It is generally recommended that noncorrosive water be used for filling these irons. $18-$25.

Knife Sharpener. One type comes as an attachment to a mixer. Another type is a small compact unit which plugs into a convenience outlet. It has steel clips which position the blade for precision sharpening. $10.

Ice Cream Freezer. With an electric freezer it's a good way to get surplus cream into containers for freezer locker storage. Freezers can be had for $25 up, with non-warping tubs, heavy tinned cream cans, self-adjusting wood bar scrapers, enclosed motor and gear drive assembly.

Some mixers have a freezer attachment for 3- to 4-quart freezers.

Mixer. Today's electric mixers are real working tools for any kitchen. They have powerful motors with extra speeds. The deep oval shaped beaters incorporate air and give good volume to doughs and batters. Portable mixers can be used at the work bench or at the range. The stationary style mixer stays on the work bench and hot foods are brought to it. All the mixers will beat, whip, mix and juice fruits. Some of them have a power unit and special attachments to shred, slice, shell, peel, puree or grind foods, churn butter and freeze ice cream. $35-$80.

Night Light. A small light burning every night where there's an irregular step, long hall or open stair wall can mean the difference between a sound and a broken body. Such a light can also contribute to sounder sleeping for those who are ill or for small children who need night time care and would waken with the switching on of a bright light.

If turned on 8 hours every night your meter will register less than 2 kilowatt hours a month. Lights and fixtures range from 40 cents to $5.

Range. Electric ranges with the many controlled selected heats for oven baking and surface cooking, and self cleaning units have no resemblance to the old cooking stoves. And electric ranges are really fast. Being well insulated they're cool to work around.

There are standard size ranges with one and two ovens; also the space saving range which is half the size but has one standard size oven and three to four surface units.

For kitchens where winter heating is a problem there are combination coal-wood or oil and electric ranges. Such a combination needs a flue connection. It makes it possible to have controlled surface and oven cooking.

Features of different ranges are large bake ovens and broilers with adjustable racks, removable or enclosed baking units, and counter-balanced oven doors. Some have a built-in roaster, cake griddle, saucepan, deep well cooker, a well cooker unit which can be raised to the level of the top of range for an extra surface unit. Then there are convenience outlets, some of them time controlled, automatic clock, minute minder, surface and oven light, oven window, storage space, warming compartment, and rotary and push button lighted switches located on back splasher or front of range. All electric ranges require special wiring.

Refrigerator. Refrigerators keep having temperature, humidity, and storage space improvements added all the time to make them more serviceable and less expensive to operate. Probably the most outstanding features for farm homes are the two-temperature arrangements. With such refrigerators one can have plenty of flexible storage space for every-day 40-degree refrigeration. Then right there, convenient to your mixing center and range, is a one to two cubic foot zero freezing compartment. This will hold 30 to 60 pounds of frozen foods.

A number of refrigerators have special high humidity compartments to reduce evaporation of foods. Because motors are smaller and take up less space, manufacturers are able to make the interiors larger without changing outside dimensions. This is helpful where kitchens have already been remodeled.

Shelves are adjustable and in sections; some pull out and have lockstops. Once more it is possible to get some refrigerators with left-hand doors.

Roaster. An insulated electric roaster with automatic heat control is a wonderful way to get acquainted with electric cooking.

A roaster with 1320 watts requires no special wiring, but should always be plugged into a convenience outlet. It should nev-

Faster Cleaning... floor to Ceiling!

Here's the *all-purpose* cleaner. It's fast and thorough on your rugs. And wait till you see how quickly it cleans draperies, upholstery . . . even lamp shades and linoleum!

This new Hamilton Beach cylinder model is more powerful than ever. Yet it's the *quietest* cleaner we've ever made.

Below are the six features that make Hamilton Beach your best buy. Read them over, see how they save you time and effort. Then, have your dealer demonstrate them and you'll agree that here, actually, is faster cleaning . . . floor to ceiling! *Hamilton Beach Company, Division of Scovill Manufacturing Co., Racine, Wis.*

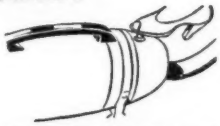
DOUBLE-ACTION FLOOR NOZZLE
picks up lint, hair, thread . . . gets embedded dirt, too! Rubber body protects furniture.

SUCTION REGULATOR SLOT
reduces suction. Keeps delicate fabrics out of nozzle. Thumb over slot restores suction to full volume.

FOUR-WHEEL CARRIAGE
rolls easily. Wide-tread, soft rubber wheels prevent rug scuffing. Front wheels lock for safety on stairs.

For faster cleaning . . . floor to ceiling . . . it's Hamilton Beach!

SWIVEL-NECKED WALL AND FLOOR BRUSH glides under beds, over door casings, anywhere! Gets into all those hard-to-reach places.



TOE-OPERATED SWITCH controls motor. Step on it to start—step on it to stop. Ruggedly built for years of heavy use.

POWERFUL MOTOR with more suction than ever! Gets embedded dirt. It's quiet. It never needs oiling—ball bearings are grease-packed.

Guaranteed by Good Housekeeping

See the new Hamilton Beach De Luxe Upright Cleaner. Its big, bright headlight shows up dim-corner dirt . . . its triple-action floor nozzle beats and sweeps while powerful suction swoops up clinging litter. Saves time . . . saves work . . . saves rugs!

HAMILTON BEACH
Vacuum Cleaners

er be plugged into a lamp socket or extension cord. It can be used anywhere. You can take prepared food to church suppers, picnics and other social gatherings and keep it hot.

The special roaster features available are lifting and baking racks, inset cooking utensils, broiler and grid attachment, vapor seal cover with adjustable vent, signal light, and automatic clock. Some roasters have a special base cabinet in which can be stored the accessories. $35-$100.

Scissors. Electric scissors for home use reduce cutting time to about one-half. The action of the blades is so fast and minute that it's almost impossible to cut oneself. Electric scissors cut smooth edges. $9 up.

Sealing Tools. In preparing packaged foods for freezing, many containers call for seals to be completed with applied heat. If you do much freezing, it saves time to have the heat sealer with all the supplies for freezing.

The most convenient thing to use is a small appliance designed just for freezing work. You plug it in, grasp the hinged plastic case in the right hand, insert the closure, then close the heated presser. Of course, one can also use a curling iron or hand iron with temperature control.

Sewing Machine. A fine, precision-built sewing machine can be serviceable to your second and third generations.

A cabinet type machine is less likely to be picked up and carried through the house or over rough roads. As a result it will be used more by one or two operators. There is also the convenience of having everything necessary for the machine stored within finger tip reach.

The portable machines are popular. They should be stored carefully and used on firm tables low enough for the operator to work without stretching.

Modern sewing machines have many attachments, are quiet and practically vibrationless, at all speeds.

Sewing Machine Motor. It is possible to electrify a good foot treadle sewing machine by using a special electric motor with variable speed controls. The motor is mounted on the machine head and drives the fly-wheel either by friction or by means of a short belt. Start, stop and speed are controlled by operator's foot. Cost around $20.

Shaver, Clipper. Clipper can be had with a tapering comb attachment with On and Off switch, and a built-in radio interference eliminator.

Shavers are used on dry skin. Made in ac and combination ac-dc types. If it goes with the men and boys to the fairs, special stock shows and sales, conventions or vacation trips, you should have an ac-dc shaver.

The current consumption is negligible. Folks usually need several weeks trial to learn to like electric shavers. $13-$25.

Timers. Electrically operated clocks are made for use as "minute minders". They time operations up to 30 minutes or an hour, then ring an alarm. Other timer clocks are made to close an electric switch. They are set like an alarm clock. Plug in a radio and it will wake you to music; or plug in the coffee maker and have coffee when you wake up. Still another type will turn the current on for 15 minute or longer intervals any time during the day.

Toaster. An automatic toaster at the table lets each person make his toast as he likes it. It will cost about one-fourth as much as making toast in the range oven. There are some with selectors, to regulate the brownness of the toast, and to make it crisp or soft. Some pop-up the toast or hold it in the toaster at reduced heat to keep it warm or to make melba toast. Some have voltage regulators. $19-$26.

"He says he was only trying to cool off the little man who pushes up the toast!"

Other types of toasters are the semi-automatic, non-automatic, and grill which require constant attention. Some of these toast bread on both sides at the same time. Others require the turning of the bread for complete browning. $5-$15.

Tea Kettle. Tea kettles are important utensils in many farm homes even after there is automatic hot water service. There is an electric tea kettle of about a 3-quart size which can give you fast inexpensive boiling service. $10.

Vacuum Cleaner. There is nothing like a vacuum cleaner to keep the house clean and free from dust. The electricity used for a year will cost less than a new broom. Vacuum cleaners come in two styles—the upright and cylinder. There are many models to choose from in each style. Your house furnishings really determine the type which will be most serviceable to you. Many families find it useful to have one of each type: Both types have attachments for all above floor cleaning jobs. Attachments available are dusting brush, crevice tube, floor and wall brush, demother, sprayer, upholstery tool, drapery nozzle, floor waxer, and polisher. $65-$125.

Washer. The past 10 years have brought many new developments in clothes washers. There are automatic and conventional types, and each has many models.

Most automatics do best with permanent plumbing, wiring, and fastening to the floor where used, plenty of soft hot and cold water, and good fast drainage bypassing the septic tank.

Automatics will do about everything but pretreat the garments for washing. They will soak, wash, rinse, spin dry, and shut off automatically. The amount of water used will vary with the cylinder and agitator models. Some are loaded from the top, others from the front. The load capacity is about 9 dry pounds, and usually 45 to 60 minutes are allowed for a complete washing cycle.

In some washers you can re-use the suds or rinse water.

There is one washer which has an extra separate tub which can be inserted for dishwashing.

Conventional washers with easy

Making farm work LIGHTER with G-E lamps!

THE LAMP THAT GIVES CHICKS AN APPETITE!

Chicks eat more when feeders are warmed by a G-E infrared heat lamp. Litter keeps dry too. Standard model now only **$1.10**

GRADE PRODUCE BETTER

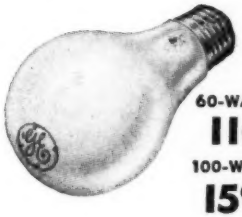
with G-E fluorescent lamps in a fixture like this over your grading tables and storage bins. They give you bright light aplenty without annoying glare. They bring out the true color of your fruits and vegetables. You can grade faster . . . more accurately. A 40-watt G-E fluorescent lamp costs you just **$1.00**

LETS YOU LOAD HAY AT NIGHT!

For a flood of light in your haymow, use G-E reflector lamps. The reflector is built right into the lamp. 150-watt, spot or flood . . **$1.05**

WORK WITHOUT SHADOWS with G-E fluorescent lamps over your workbench. You won't "get in your own light".

00 CHORES FASTER with plenty of standard G-E incandescent lamps at strategic points in and around your buildings. Put them in your feed room, in each bay of your sheep barn, wherever you need good light to work by. And, remember, General Electric research is always at work to make G-E lamps *Stay Brighter Longer!*



60-WATT **11¢**

100-WATT **15¢**

G-E LAMPS

GENERAL ELECTRIC

LIST PRICES SUBJECT TO APPLICABLE FEDERAL EXCISE TAXES

to roll casters shorten wash days. They can be rolled to the source of water and to good drainage so that no carrying of water is necessary. Today's washers have spin dry baskets, or sensitive safety wringers which can instantly stop wringer action and release pressure. Wringers have drain boards which automatically tilt either way with wringer use. There are washers with two washing speeds, bell timers, minute minders, and drain pumps. Capacity loads vary with size and price of washer from 7 to 10 pounds.

Portable Washer. Portable washers have many uses in a young growing family. They use about one-fourth as much water as a regular washer. Designed to do light laundry work the different models hold two to four dry pounds. Some models extract the water by spinning, others can have small hand wringers attached to the tubs. You can put a portable washer into the car with the luggage when you go vacationing. $20-$35.

Waffle Baker. Features to be found in new waffle bakers are larger, faster baking grids, automatic control, heat indicator, light or dials, broad base or trough to catch batter overflow, expansion hinge to prevent soggy waffles, pretreated grids, cool base to protect table top.

Water Heater. Modern living, more and more, demands plenty of hot water. It's used for about 100 jobs around the house, and cold water for about 10. The first thing we think about as needing hot water are the cleaning of dishes, house, clothing, and personal hygiene. Then those who have had family or livestock illnesses know how valuable it is to have 24-hour hot water service for emergencies. Because electric water heaters require no venting you can install them in any living area. Avoid the waste and loss of hot water through long pipe runs and put the heater close to the most frequently used faucet.

An average family of five will use about 1500 gallons of 145° hot water a month.

See also Section 15, Water Heating.

Waxer. For those homes with hard top floor coverings which require waxing and polishing, there are light and heavy weight floor waxers. Some vacuum cleaner manufacturers offer an attachment for floor waxing.

Section 6

Farm Wiring and Control Devices

IT WILL pay you to be wise about wiring. Wires get electricity from your supplier's line to the place where you put it to work. A milker or a brooder without proper wiring is like a hired man without legs.

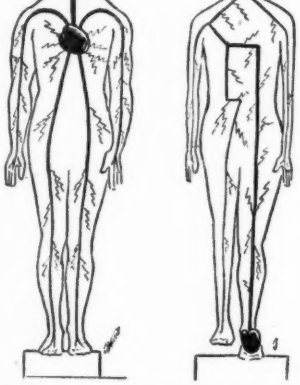
If you use a "lot" of electricity, you will need a "lot" of wire to get it there. The longer the wire, the bigger it must be.

Load Center Metering

In all new farm wiring an attempt is usually made to get the meter and distribution point as near the "center of use" of electricity as possible. It may be on a pole erected especially for the purpose. It may be from a building which is near the "center of load". The advantages are that you can save on wire; you get better service; it is easier to make additions to the wiring. The accompanying drawings and captions explain this more fully.

Three-Wire Service

Few farms these days have less than three wire service. That provides 230 volts for motors, heaters and heavy equipment and 115 volts for lights and small appliances. Sixty ampere entrances are the smallest; 100 amperes are widely used, and there are many 200 amp and larger services. The size of the service depends on the amount of electricity you are going to use.



Left: Wires are the arteries and veins that carry electricity to all parts of the "Body" of the farm. If you want a sturdy body without weak parts, start your wire "arteries" at the "heart" of your load. From this center point, main wires should radiate to important centers of action—house, barn, milk house, poultry house, granary, etc.

Right: "Heart in the foot" wiring. The long, strung out artery wires give poor electrical distribution, weak "arms" and "legs" that do not function properly, and a circulatory system that requires doctoring and cannot be depended on.

Kinds of Wiring

All wire used between buildings is outside weatherproof wire. The smaller sizes are solid; the larger ones stranded. Several insulated wires may be combined in one cable.

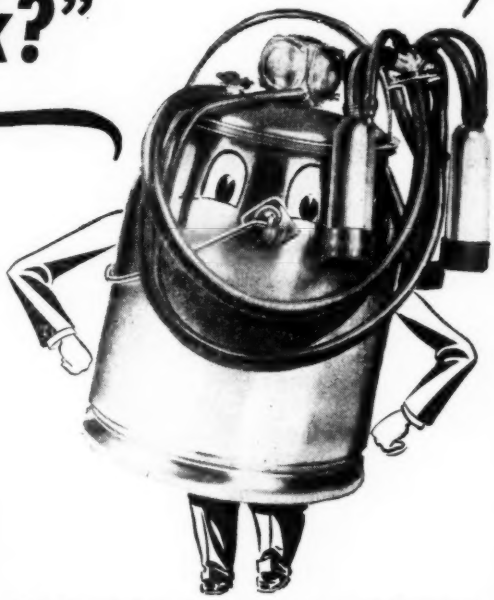
Underground wire between buildings may be fabric covered parkway cable, or lead covered. New plastic covered wire is now coming on the market which may be approved for underground use. All of these wires may be buried directly in the soil. For ease of repair or replacement, in case of difficulty, it is well to run them in tile or pipe.

Interior wiring is rubber insulated. It may or may not have a fabric braid over it. Usually it comes in different colors for identification.

This wire may be supported on knobs and tubes of porcelain attached to the building framework. Most early jobs were knob and tube wiring. It is still good wiring if properly installed, and no additions are made by untrained persons.

In a conduit wiring system, pipes or conduits are first installed and the wires then pulled into them. They are not generally recommended for farm buildings. The first cost is higher, water sometimes condenses in the pipes and rots

"Who ever heard of a Cow 'GIVING' Milk?"



Sure—a cow *produces* milk—and works hard at it too. But she can't "give" you that milk. You have to take it from her.

Your cows should be milked in a fast, gentle manner, similar to that of a sucking calf. A McCormick-Deering Milker assures you of just such milking efficiency. By milking quickly and thoroughly, a McCormick-Deering Milker steps up your milk production, giving you more milk to sell than ever before. It guards the health of your herd at milking time with its gentle, massaging action and correct, dependable vacuum.

You'll quickly discover that a McCormick-Deering is a real asset in your dairy barn.

Safety and sanitation go hand in hand with a McCormick-Deering Milker. Its stainless steel construction means smooth, easy-to-clean surfaces that lead to the production of cleaner, better milk and a surprisingly low bacteria count.

Positive milking action is supplied by a simply designed pulsator that requires no oil for successful operation. There's not a chance of losing milk through contamination by oil. Then too, a McCormick-Deering Milker saves you substantial time, labor and expense.

Let your International Harvester Dealer give you the facts about this modern, gentle milking machine. Try a McCormick-Deering Milker—let it prove its many benefits to you.

INTERNATIONAL HARVESTER COMPANY
180 N. Michigan Ave. • Chicago 1, Ill.

Listen to James Melton on "Harvest of Stars" Every Wednesday Night—CBS.

INTERNATIONAL HARVESTER

McCormick-Deering Milkers

the insulation and there is often rusting at the pipe threads.

Flexible metallic sheathed cable, commonly known as BX, is widely used in house wiring. It is not suitable for damp or wet places unless provided with an inner lead sheath. For this reason it is not generally used in farm buildings.

Non-metallic sheathed cable has been most popular on farms in recent years. It is suitable for use in all farm buildings. There has been some difficulty with the insulation of this cable rotting where it passes between rooms of different temperature. New cables have now been offered having thin plastic coatings that are very tough and resistant to water and moisture.

Fuses

Fuses are safety valves placed in a circuit to limit the current to the safe capacity of the wire. If overloaded, the fuse will melt. See page 52 for description of fusetrons.

Books on Wiring

"THE NATIONAL ELECTRICAL CODE", which is revised every few years, gives regulations for safe wiring to prevent fires. It is technical. For wiremen. Available from National Board of Fire Underwriters, 222 W. Adams St., Chicago 6, Ill. 10c.

The "HANDBOOK ON FARMSTEAD WIRING DESIGN" tells how to plan farm wiring. 55 pages, 40c. Industry Committee on Wiring Design, Rm. 2650, 420 Lexington Ave., New York 17, N. Y.

Westinghouse, General Electric, several state agricultural colleges, and a number of power suppliers have good bulletins on farm wiring. If you are planning new wiring or additions to your wiring, consult your power supplier. He can tell you of any local regulations, where to get information, wiring supplies, or where to hire a contractor.

Electric Controls

Throughout this issue we have mentioned automatic operation, time switches, pressure controls and thermostats many times. One of the big advantages of electricity is its ease of control. Many types of thermal controls will regulate temperatures by turning on and off soil heating cable, oven heaters, brooders, furnace blower motors, greenhouse ventilators and the like. Some of these thermostats sell for as little as $1.50. Some types control the temperatures only within 5° to 10°; others will hold within 1°. Some will handle large currents, some small. Some close a switch as the temperature falls (for hotbeds); others as the temperature rises (for refrigerators).

Float switches will start and stop pump motors to keep gravity tanks filled.

Pressure switches serve similar purposes of starting and stopping motors on water systems, air compressors and refrigeration machines.

Time switches are made by many manufacturers to control poultry house lights, oven or roaster cooking, the radio and many other operations.

Humidistats are also available for starting and stopping motors or heaters to regulate the moisture in the air.

Electric eyes will control electric devices for opening doors and gates, sounding burglar alarms, turning lights on on dark days, grading beans, or discovering pinholes in tin plate.

Any of these devices will control alarms, motors, heaters, lights, radios or electrically operated valves. For most any operation one wishes to control, there is usually a way to do it effortlessly with electricity.

See also p. 48 for yard light controls.

Section 7

General Farm Uses for Electricity

Alarms

Electric alarms are used to warn of prowlers, of fire, of failure of the electric current, of high or low temperatures in storage rooms or freezers or in incubators or brooders. For temperature or pressure alarms a bell rings whenever a thermostat or pressure switch circuit is closed. Similarly a power failure rings a bell operated by a battery.

Recently, central alarm systems for the farm have been placed on the market. An indicator at a central point will tell what is wrong and where. For instance, if hay in the mow is too hot, if the freezer current is off, or there is fire in the garage.

Clippers

Animal clippers for clipping cows, horses and dogs are made by several manufacturers. They are standard equipment. (See also Sheep Shears.)

Communication Systems

A number of intercommunication systems suitable for farm use are now available. Some are of the walkie-talkie type, operated by batteries.

Other loud speaker systems take their power from the 115 v, ac supply line. Some of them have one or more master stations for both sending and receiving and may have any number of receiving loud speakers. This type of equipment is now commonly used in offices.

Corn and Grain Drying

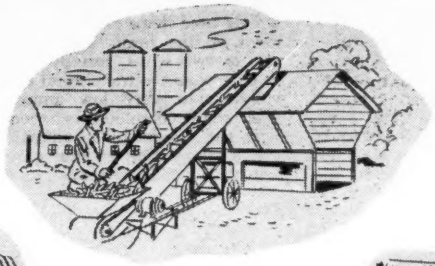
Corn has been dried successfully with forced ventilation in Oregon prune driers of the tray type, in slatted bottom bins and in cribs equipped with slatted air ducts. The drying was done in cribs in the Middle West without supplemental heat during October and in the spring months. Drying was satisfactory when the temperature was 60° or above and the relative humidity 65% or below.

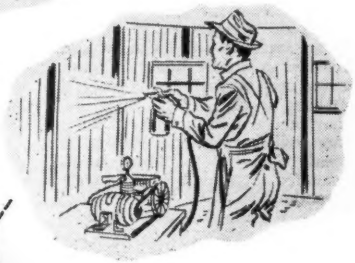
If periods of warm, dry weather are not available for drying in the fall, two procedures are possible: One is to use some supplemental heat in drying. This is surest. The other is to dry the corn during the first warm days in the spring. It will keep with high moisture during cold weather.

Grain drying is usually done at elevators. Some farm driers are being used experimentally. Grain and grain sorghums have been dried successfully in burlap bags placed over the ducts of hay finishers. Where attempted, all other openings from the ducts should be tightly sealed so as to force all of the air through the grain. Unless you have a high pressure blower it is best not to try to force air through a thickness of more than one bag of grain.

Corn and Cob Crusher

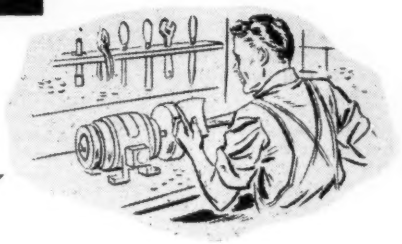
An ear corn crusher is being





HELP AT HAND . . . NOW!

Fairbanks-Morse Farm Motors



Now you can repower that grinder, sheller — your workroom tools and other equipment — with genuine Fairbanks-Morse single phase motors! These long-time farm standbys are ideal for mechanizing hand-operated equipment and/or replacing worn-out, inefficient motors. Used wherever electric power is needed on your farm. Once installed, they ask no pampering — you can forget them except for occasional re-oiling. Write for address of nearest dealer or branch office. Fairbanks, Morse & Co., Chicago 5, Illinois.

FAIRBANKS-MORSE

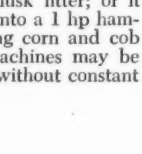
A name worth remembering

DIESEL LOCOMOTIVES • DIESEL ENGINES • STOKERS • SCALES • MOTORS • GENERATORS • RAILROAD MOTOR CARS and STANDPIPES • PUMPS • FARM EQUIPMENT • MAGNETOS

built especially for electric drive. It will handle husked or snapped corn. It has a large conical shaped hopper that holds about a bushel. It can be fed from an overhead bin for continuous automatic operation. The crusher has a capacity of about 400 pounds per hour and is driven by a 1 hp motor. The corn is completely shelled from the cob and the cob crushed to pieces about the size of kernels of corn. Very little of the corn is cracked. A screen attachment to the machine separates into shelled corn, crushed cobs and husks. The machine may be used for shelling and making a cob or husk litter; or it may feed directly into a 1 hp hammer mill for making corn and cob meal. The two machines may be operated together without constant attention.

Corn Shellers

Corn shellers for electric drive are of three kinds: 1. The ordinary one and two hole hand shellers of the plate type. 2. Cylinder shellers. 3. Corn and cob crushers.



Some plate shellers are made for electric drive. Practically any of them may be easily equipped with a motor drive.

Single hole shellers can be run with ¼ to ½ hp motors; 2-hole shellers with ½ to 1 hp. Higher speeds increase the power requirements. The power used per 100 pounds of shelled corn ranges from about 0.04 to 0.14 kw-hr.

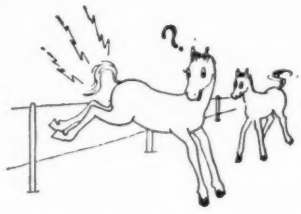
Cylinder shellers require 3 to 5 hp and handle up to 250 bu per hr. A 2 hp cylinder sheller was made some 8 years ago but is no longer available. The cylinder sheller is fed from a hopper and is subject to semi-automatic operation. It costs around $75.

Concrete Mixers

Concrete mixers used on farms are usually of the 3 cu ft (1 sack) size made for hand or belt operation. These mixers can be driven very satisfactorily by ¼ hp motors. They should either be provided with 28 or 30 in. pulleys with a 2 in. pulley on the motor, or should have a jack shaft for speed reduction. Cover the motor with sheet-iron to keep dirt and concrete off from it.

Electric Fence

Electric fence is one of the most widely used items of electric equipment on the farm. It consists of one or two wires, usually barbed, that carry an electric current of high voltage but very low amperage. The circuit completed between the wire and ground by an animal creates a sharp sting without physical injury. After a few shocks, animals



avoid the wires. The special current used is produced by a "fence controller." When properly designed and built, these controllers produce current that is safe but effective. Current to the controller is supplied either from the lighting circuit or from storage or dry cell batteries. The controllers for batteries and high line current are not interchangeable, but both may be contained in a double purpose unit.

Homemade electric fences are extremely dangerous. They should never be experimented with or used. Controllers approved by the Wisconsin Industrial Commission or National Board of Fire Underwriters are considered safe.

Electric fence does not require the rigid construction of other types. Their ease of construction makes them especially suitable as temporary fences for dividing pastures, hogging down corn and cleaning up ditch banks.

Elevators and Conveyors

Elevators and conveyors find many uses on farms.

Cup type elevators in granaries are easy to install and require little power. Equipment of all sizes and types is available.

For Platform Elevators and Litter Conveyors see Section 9, Poultry Production.

Until the last few years, drag type elevators for grain, ear corn and hay have been large, heavy machines for tractor or engine operation. More recently farmers have been building their own elevators. They have found that drag type elevators as narrow as 6 in. with sloping top boards and equipped with motors of ¼ to ½ hp will handle grain, ear corn and baled hay satisfactorily and fast enough. These elevators are lighter and easier to handle.

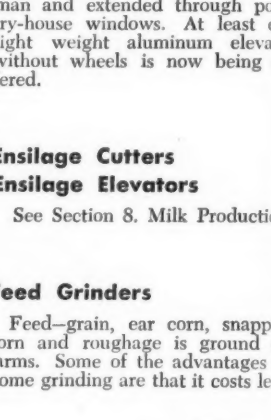
Farmer built elevators have mostly been without carriages. The small units developed by manufacturers have been largely wheel mounted. There still seems to be an unsatisfied demand especially from poultrymen for a conveyor-elevator that can be handled by one man and extended through poultry-house windows. At least one light weight aluminum elevator without wheels is now being offered.

Ensilage Cutters
Ensilage Elevators

See Section 8. Milk Production.

Feed Grinders

Feed—grain, ear corn, snapped corn and roughage is ground on farms. Some of the advantages of home grinding are that it costs less,



it saves hauling, it frequently takes less labor and the feed is fresher. It eliminates waiting at the mill or for the grinder.

In using electric motors for grinding, one must decide whether to use large grinders and motors and grind, say once a week, or small grinders and motors and grind more often.

Few farmers can afford the time to stand and shovel grain into a small grinder. A one horsepower electric grinder will grind feed for 50 cows, and do it every day while you do other chores. It takes some planning and constructing of overhead bins and spouts to feed the

mill to have it grind automatically. Whenever a farmer has made the change, he has been happy. Head work instead of back work.

Hammer mills are the most popular type. They handle anything from straw to limestone. They are available in sizes of 1, 2, 3, and 5 hp and up. They will crack corn or grind to flour. They are high speed machines (1800 to 5000 rpm) adapted to motor drive. Most of the mills have blowers which elevate the ground material through a cyclone to overhead bins. Some of the blowers may be used for elevating without grinding. It is possible to grind several grains together for a mixed feed. Some hammer mills have chopping devices to aid grinding of ear-corn and snapped corn.

Burr mills have been proved by long use. By changing and adjusting burrs one can crack corn or grind very fine. Mills are available in sizes from ¼ hp up. The cost is less than for hammer mills. They may be adapted to semi-automatic grinding, but are more subject to clogging. Several high speed burr mills have been developed especially for automatic electric grinding. Many are in use and doing an excellent job. One *combination mill* chops roughage and feeds it through the burrs with grain to be ground as a mixed feed.

Roller mills have not been popular in this country although some feeders prefer rolled to ground grain. There is less dust in the feed. These mills are now increasing in use. They are very durable. They are available in small sizes for electric drive.

A cereal cutter operated by a ½ hp motor cuts corn, oats, wheat, etc instead of grinding it. Adjustable for different cuts. It is claimed to make 89% cut grain, 5½% chick feed and 5½% meal. Automatic feed.

Power used for feed grinding averages about 1 kw-hr per hundred pounds.

Feed Mixers

Vertical, screw-conveyor type mixers are the most common. They are made in capacities of 250, 700, 1000, 2000, 3000 and 4000 pounds and are operated by motors of ½ to 7½ hp. Medium and large sizes are fed from a bottom hopper. Mixes in 10 to 15 minutes. Costs range upward from about $100.

Small, homemade mixers have been built from rectangular wood boxes. Also from 50 gallon oil drums with shafts placed diagonally through the heads. They

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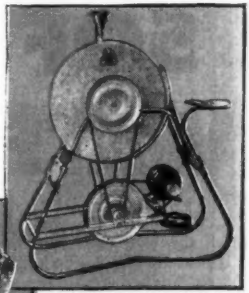

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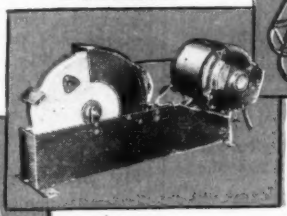

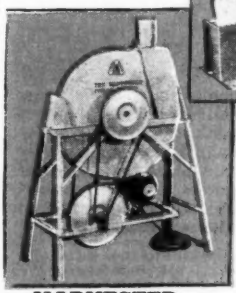

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should turn slowly, 5 to 20 rpm.

Home mixing of feeds has the advantages of using home grown feeds, always getting the same mix, and having freshly mixed feeds.

Fanning Mills

Most grain farms have fanning mills. Some come equipped with electric motors. All can be equipped. Motors of ⅓ to ½ hp will do the job. One can either replace the crank on the mill with a large pulley, or better, belt the motor to one of the higher speed shafts in the mill.

Fly Traps and Screens

Electric fly traps are usually in box form about 12" x 20" x 4" deep with an electrified grid over the top. Sour milk or just dead flies in the trap attract others. The high voltage, low amperage current on the grids electrocutes or burns the flies. Similar grids are placed over panels in window or door screens. Traps cost $18 to $30. They kill millions of flies around kitchen doors or stables. Current consumption is very small.

Fly Sprayers

Small motor-driven fly sprayers for Flit or DDT are available from several manufacturers. They provide a spray or fog very effectively for kitchens, stables and wherever flies, mosquitoes and other insects are troublesome. They plug into any convenience outlet.

Grain Treaters

Treatment of grain with dust for smut is a small motor job. Treaters are available commercially; small concrete mixers are sometimes used; many treaters are made by farmers. Construction is similar to feed mixers.

Hay Driers

During the past 25 years there have been many developments in the quick drying of hay.

Two general types of driers survived the experimental periods.

The **tunnel driers** are metal and masonry structures up to 200 ft. long through which a uniform mattress of green hay is carried on a conveyor. Air at 240° to 300° F. is blown across, beneath and through the hay. The hay comes out at the far end ready to chop or grind.

Rotating drum driers may be single drums or multiple drums, one inside of the other. The outer drum of a multiple drum drier may be 7 ft in diameter and 20 ft long, the middle drum 5 ft and the inner drum 3 ft in diameter. Chopped green hay is fed successively through inner, middle, and outer drums into a collector. An air blast along with the hot gases from an oil burner mix with and carry the hay through the drier. The temperature of the incoming gases is 1200° to 2000° F. The hay passes through the drier in a few minutes.

Hay driers handle fresh-cut and wet hay. They save all the leaves and produce a beautiful green hay with fine aroma and high in digestible nutrients and vitamin A. The cost of the driers ranges from $5,000 to $20,000 or more. Capacities are 1 to 3 tons per hour. Drying costs have been estimated at $4 to $10 per ton.

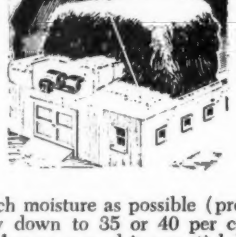
Hay Blowers

Chopped hay blowers are now available from a number of manufacturers. They take hay dumped from a wagon, convey it to the blower and blow it into the mow. Power required 5 to 30 hp.

Three Eastern companies are making long hay blowers. They have capacities of 2 to 6 tons of long dry hay per hr or 10 to 20 tons of chopped hay and require 10 to 20 hp for successful operation.

Hay Finishers

The hay finisher should not be confused with hay driers. The finisher takes hay from which as much moisture as possible (preferably down to 35 or 40 per cent) has been removed in a partial day's curing in the field. The curing is finished in the haymow or in a special structure. The curing is done by blowing air through the hay by means of a system of air ducts. The air may be slightly heated or unheated. A finishing system may cost from $500 up. The trend has been to greatly simplify the air distribution system in mows. The simplest system at present consists of one main air duct down



the center of the mow over which the hay is stacked. The hay may be either long, chopped or baled. Hay chopped into 4 to 6 inch lengths or loosely baled seems to be gaining in favor. Motor driven blowers of 3 to 7½ hp supply the air.

Mow finishing has stimulated entirely new methods of handling hay from field to mow. They include motor driven choppers, blowers and elevators, developed largely on farms.

Circular metal haymakers, similar to large silos with perforated walls and a center vertical slatted air duct are becoming popular. Air passes outward through the hay or is drawn in through it. The air can circulate naturally, but blowers are generally used for quicker finishing and better quality.

Crop Driers are being manufactured by several companies in the Middle West and East. In general these driers consist of oil burners and fans mounted as a portable unit. The unit delivers heated air under static pressures up to about 1½ in. of water. Motors are 5 and 7½ hp, fan capacities around 13,000 to 22,000 cfm. The oil burners are figured to raise the temperature of air delivered by about 100°. The air is driven through a flexible connection into the duct system of a crib, mow, bin or specially equipped hay wagon.

Ducts and flues made of perforated metal and of heavy welded wire screen are available.

A few **contractors** now design and install complete hay finisher systems. The great majority, however, are designed and installation supervised by agricultural engineers with fan manufacturers, with state colleges or with electric power suppliers.

Hay Hoists

Hay hoists for electric operation are available from a number of companies in single and double drum types. In some, a second drum may be added to a single drum hoist. The second drum is smaller and faster and used for pulling back the fork. Costs range from $75 up. Power needed, from 1 to 5 hp.

Our recommendation has always been not to invest in a hay hoist unless you are willing to rig it up so it will save manlabor and horselabor or tractors at haying time. That means that the hoist should be operated by the man on the load by means of ropes. We prefer a single-drum hoist with weighted pullback.

Chopped hay may be handled

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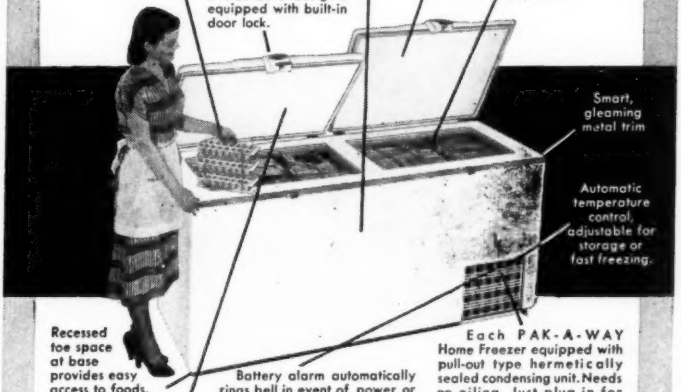

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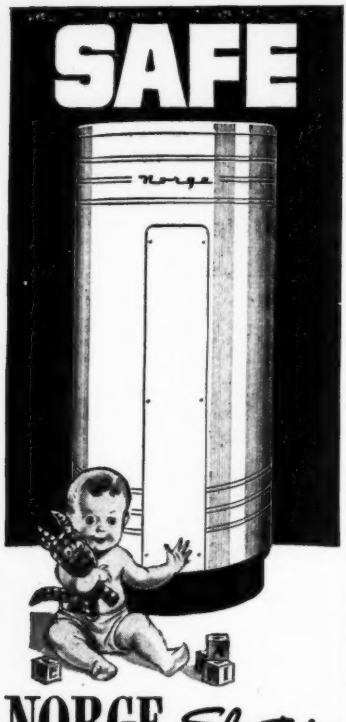

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with rope or snow-fence slings; baled hay with slings or loose-tined grapple forks; long hay with slings or forks. A hoist permits using track and carrier equipment available in many barns.

House Heating

Coal Stokers

Electrically operated stokers may be installed in most coal fired heating plants. They are available in different sizes. The stoker hopper is filled with coal once per day and clinkers removed. The remainder of the time the temperature set on the thermostat is maintained automatically whether you are at home or not. The electric power used is small. Some stokers have feed screws that extend into the coal bin so not even the hopper needs to be filled.

Electric Heat Controls

Fuel burning furnaces that are dependent on adjustment of drafts for heat regulation can be supplied with electric controls. A thermostat is placed in a living room. It opens and closes the drafts electrically to provide uniform heat.

Electric House Heating

Electric house heating is not as yet competitive in cost with fuel burning heaters except in mild climates and where rates for electricity are 1c per kw-hr or less. Electric heating is usually done on a room basis with separate controls for each room. Large convection type heaters are most frequently used. They may be portable or set in the wall. Rooms are heated quickly and there is no labor or dirt from coal and ashes.

The use of portable heaters for bath rooms and for supplemental heat in other rooms is common practice. Either fan type or radiant heaters or electric steam radiators are suitable heaters. They cost from a few dollars to about $20 for the heavy duty types. See also Section 5.

Forced Air Circulation

Hot air furnaces which do not deliver sufficient air to certain rooms can sometimes have the circulation improved by inserting small motor-driven fans in the heat pipes. Fans are made for that purpose. The room must also have a cold air outlet.

Heat Pumps

Heat pumps have been used for heating office buildings for a number of years. During the past two winters many have been installed experimentally in residences. (See also Milk House Heating and Refrigeration. Sections 8 and 13.)

The heat pump is a refrigeration machine used backwards. Instead of taking heat out of foods in a refrigerator and dissipating it in the kitchen air or by means of a water cooled condenser, heat is taken from the ground or from well water and released in the house. This heat is distributed much the same as with any hot air heating system.

The advantage of the heat pump is that it takes only 1/5 to ½ as many kw-hrs to produce the same warming effect as with direct electric radiation. The heat is not created. It is merely transferred from the water to the room. Another advantage of the heat pump is that it may be used for house cooling in the summer time by merely opening and closing valves. Power required is about 1 hp per room or less. The equipment is still more or less in the experimental stage. An installation might cost $1200 plus cost of well and pump, if needed.

Heated Wall Panels

Heated wall panels and floors are being used more and more as a means of house heating. Usually hot water coils are placed in the floors. Some heating has been done with electrically heated panels. The earlier panels were made by embedding soil-heating cables in the plaster. Now heating panels of rubber and other materials are available. The theory of panel heating is that one's body radiates heat to the cold walls. If the walls are warmed a person in the room will be comfortable at lower air temperatures than where air heating is used.

Jet Heat

Jet Heat has developed from the jet airplane engine. The oil burner for a six-room house is concentrated in a space 2' x 2' x 3'. It is electrically controlled and has electric air circulation. The pipes for conducting the hot air are only 3" in diameter and of flexible metal hose which can be "fished" into the walls. A single ingenious radi-

ator for each room takes in cold air, and recirculates warmed air. The plant is claimed to be about 96% efficient as compared with 75% efficiency for ordinary hot air furnaces. Furnace for six room house about $400; installed $700. Just coming on the market. Still very new.

Oil Burners

Where oil fuel is available, the oil burner furnishes an almost carefree source of heat. It is automatically controlled by a thermostat. Oil burners may be installed in old heating plants, but generally they are not as satisfactory or economical as heaters made especially for burning oil. They are electrically operated and controlled.

Water Circulators

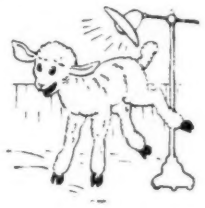
Water circulators are electrically driven pumps which may be inserted in the piping from a hot water heating boiler to give faster flow of hot water through the radiators. They are incorporated in some hot water heating plants.

Hedge Trimmers

Hedge Trimmers, electrically driven, are made by several manufacturers. Some have cutter blades similar to a mowing machine. Some have two moving cutter blades. One has a rotating cutter with a cutting action similar to a sickle. Prices range from $30 to $45.

Lamb Brooders

Lamb Brooders have been used most extensively in the Pacific Northwest and at Ohio Agricultural Experiment Station. A lamb brooder usually consists of a fenced



enclosure or box with a lamp and reflector at the top used as a heater. In Ohio, the ewe is fenced in with the lamb. The brooder is an open front triangular box placed in the corner of the pen. The heater is an R-40, 150 watt reflector flood lamp.

The brooder dries, and keeps the new-born lamb from chilling. It saves lambs and gives them a good start even with below zero temperatures.

Lawn Mowers

Lawn Mowers of several types are on the market. The common reel-type mower equipped with ¼ hp motor and a long flexible rubber insulated cord takes much of the labor out of lawn mowing. Another type has a rotating blade which cuts similar to a sickle. The blade is protected by a guard. With a little practice, it is not difficult to keep the cord out of the way of the mower. Another type mower uses a storage battery which may be recharged from the 115 volt house current. The cost of electric mowers is from $80 up.

Illustration (p. 32) shows an old 16" lawn mower equipped with a ¼ hp motor. Enough was cut off the cutter blades at one end to give room for a 5" V pulley which was bolted to the reel spider. A light

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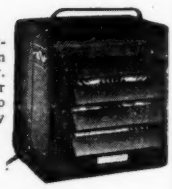
MODEL AN-30

Combination portable and suspension type electric heater. Recommended for rooms measuring up to approximately 12 by 16 ft.



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steel platform was attached to two cross rods to support the motor. Motor pulley was 2" giving a reel

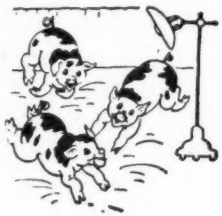
speed of about 640 rpm. The driving dogs were removed from the wheels so the motor just drives the reel. The mower can be eased up to trees and bushes or pushed slowly through heavy grass. A control switch is conveniently located at the top of the handle.

Lights for Fattening Hogs

Last winter at least two farmers used all-night lights for fattening hogs. Hog waterers with electric heat were provided. Feeding was done in self-feeders. Three advantages were reported. 1. The hogs made faster gains. 2. There was no fighting to get to the feed hoppers. 3. More hogs could be fattened on the same floor area. The practice is new but offers much promise.

Pig Brooders

All sections of the country now use pig brooders extensively. They



save pigs in early litters and give them a better start. In an experiment at Purdue University it was found that by using electric pig brooders they had 30 percent more pigs at weaning time.

The first pig brooders were enclosures fenced across the corner of the farrowing pen. They usually had a solid boarded flat roof about 16" to 20" above the floor. In the center of this roof was an opening for a 150 to 250 watt lamp and reflector. The pigs were kept warm and dry and away from the sow so they would not be crushed. Those brooders were eminently successful as well as being simple. Many farmers now just fence off a corner so the pigs can get under and the sow is kept out. Then they hang one of the new reflector type heat lamps above this corner. The lamp can be raised or lowered to give the intensity of heat desired.

Be sure the wiring in the pen is well insulated and protected from the sow and pigs. Place the lamp so straw cannot pile up around it.

For still better results Dan Rumler puts each pig on straw in a tub as it is dropped. The tub is covered with burlap and a heat lamp hung above it. When all of the pigs are born, they are taken back to the sow and each has a chance at the first colostrum milk. It helps prevent runts.

In some large farrowing houses "creeps" are provided from each farrowing pen to a heated feeding pen for the pigs. The pigs eat in comfort unhampered by the sows.

Television

Television has made rapid advances in the past year. Many sets are now on the market at prices from $150 up. It is still some way off for most farms. At present the broadcasting radius is limited to about 50 miles. One company is experimenting with rebroadcasting from airplanes high above the earth. One plane is already equipped and has successfully covered a circular area at least five hundred miles in diameter. As more of these flying transmitters are put into service, more and more farms will have television available.

Tobacco Curing and Grading

Flue cured tobacco requires heat for the curing process. There has been a decided shift to automatically controlled, electrically operated coal stokers for heating. They provide more uniform temperatures during yellowing, an automatic rise in temperature during drying, and

an even heat day and night.

Experimental work is also under way on improved methods of curing flue cured and Burley tobacco involving the use of fans and heat.

It is reported by the USDA that the efficiency in grading tobacco is increased as much as 30 percent when fluorescent light is used in place of daylight.

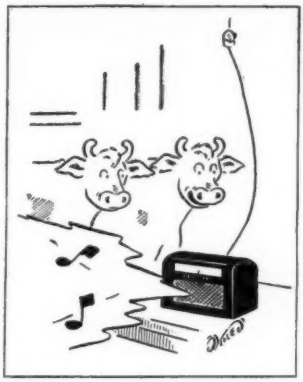
Sheep Shears

There are two kinds of electric sheep shears. One is a self-contained unit with the motor in the handle. It is especially suitable for small flocks. Interchangeable heads make it usable also for clipping animals.

Professional shearers are usually partial to the jointed shaft shears driven by a ¾ hp motor. They have more speed and power.

Radio

Radio calls for little comment. Small sets help to lighten the burden of kitchen work. Console models with record players are common in homes. Radios are popular in the milk barn. They tend to quiet both the cows and the milkers.



"It's supposed to increase milk production. Let's hold back and insist on television."

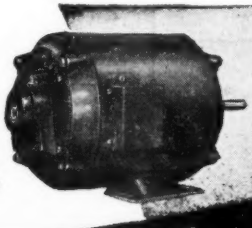
Frequency modulation sets are increasing. Reception is clearer and with less static. They are not likely to replace present sets immediately. There are fewer FM broadcasting stations.

Wagon Unloaders

A number of farmers have built grain and corn unloaders in wagons. A tight wagon bed has the bottom sloped toward the center from the sides. In the center is a belt or drag conveyor operated by a ¼ hp motor. The conveyor is covered with short boards fitted over it before the wagon is loaded. The boards are removed one at a time as the load is taken off. Motor is plugged-in at crib or granary.

Two types of hay wagon unloaders are being used. One has a sliding front end-gate which is pulled by a cable and crank or ratchet device. It pushes the load out of the rear of the wagon at the rate of about 16 in. per minute. The other is a canvas apron over the bottom of the wagon which is rolled on a roller at the rear to pull off the load. It moves at about 24 in. per minute. Both devices require a gear or speed reduction mechanism of about 800 to 1. They are powered by ⅓ or ½ hp motors.

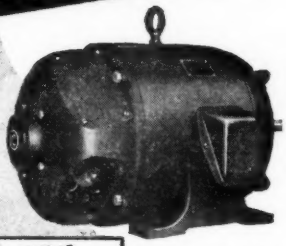
Motor-driven conveyors, new this year, take chopped material



Century ½ horsepower type RS motors

Century Repulsion Start Farm Motors

Save MONEY • Save MANPOWER • Save TIME



Century 7½ horsepower type RS motor

For more than 40 years the Century type RS, Repulsion Start Induction Brush Lifting motor has been working for the farmer.

Thousands of these motors are driving automatic water systems—hay and grain dryers—feed grinders and other modern farm equipment.

Cold weather does not affect the starting torque of these RS type motors, and the low starting current required helps prevent abnormal drops in voltage during the starting.

Specify Century motors on your electric-powered equipment.

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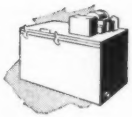
FARM WELDERS

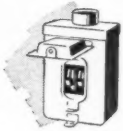


MILK COOLERS

RADIOS

FARM MOTOR CONTROLS

MOBILAIRE

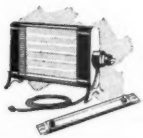


YARD POLE BREAKERS

BRYANT WIRING SUPPLIES

FARM YARD LIGHTS

FLUORESCENT LIGHTING



FARM ELECTRIC HEATING EQUIPMENT

ELECTRIC RANGES

FANS AND VENTILATORS

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LAUNDROMAT AUTOMATIC WASHER

VACUUM CLEANERS

WATER HEATERS

WATER TROUGH DE-ICER

REFRIGERATORS

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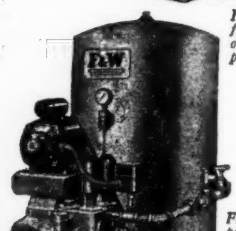
Shallow and deep well models in both jet and reciprocating types. Every F&W is tested for pressure and capacity before it leaves the factory. Your dealer will advise the model to meet your specific needs. Mail coupon for complete information now.

F&W "Bullet" Jet for shallow wells, one of the most popular models.



F&W Piston typ pumps are mad. for both shallow and deep wells.

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Please send information about F&W water systems for ☐ shallow ☐ medium ☐ deep wells.

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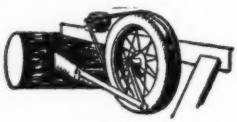
dumped out of the end or side of a wagon and transfer it to the hopper of an elevator.

Wood Saws

Cord-wood and limbs may be sawed satisfactorily with 2 or 3 hp motors and a 30 in. saw. The rate of feeding must be regulated to the power of the motor. The electric motor has much better "pull" through knots than a gas engine.

The proper tooth speed for a wood saw is 7,000 ft per min. That means 1100 rpm for a 24 in. saw, 1000 rpm for 26 in., 890 rpm for 30 in., and 830 rpm for 32 in. It is important to provide pulleys of correct sizes when changing from gas engine to motor drive.

Homemade cross-cut or drag saws have been built by many



farmers. They are driven by ¼ to ½ hp motors and will handle logs up to 30 in. in diameter. Construction is relatively simple.

Vacuum Groomers

A vacuum groomer intended especially for dairy cows was put on the market last November. It sells for about $90. Equipped with special grooming nozzle, cleaning brushes and a spray gun. Dirt compartment and motor mechanism in box 22" x 16" x 10½", on legs. Stands 28" high.

Well Drills

A well drill especially designed for farm use is now available. It has a base 6' x 6' and may be used in an 8' basement. It drills a 4" hole with a 125 lb drill at 38 strokes per min. Powered with a ⅓ or ¾ hp motor, it has a drilling rate of 9" to 15" per hr in limestone. Automatic feed-out device permits operation without constant attention.

Wood Splitters

There are no commercial wood splitters on the market to our knowledge but several have been made by farmers. A splitter developed by the University of Wisconsin has a splitting wedge welded to the outer rim of a heavy flywheel. It splits every time the wheel comes around.

Section 8

Milk Production

Barn Cleaners

Six companies now build barn cleaners of several types. Electric motors drag the manure out of the gutters into the spreader. Enough have been installed to prove their practicability. Installation costs range from $700 upward. Total power required for cleaner and elevator from 1½ to 5 hp. Power consumed is of the order of ½ kw-hr per day. Operates only 10 to 15 min per day. Many homemade barn cleaners have been installed throughout the country. Operation is similar to commercial cleaners which were patterned after them. Hundreds of gutter cleaners are now giving satisfactory, labor-saving service.

Churns

Several types of electric churns are on the market. Barrel churns may be converted easily to motor drive with either a commercial or a home-made speed reduction device. The barrel should turn at 50 to 60 rpm.

Motorized churns made commercially are of the barrel type, plunger type and dasher type. Several companies make motors of 1/10 hp with long shafts carrying paddles that extend down into a milk can or jar. They are inexpensive and are becoming quite popular. Kitchen mixers are often used for churning small quantities of butter.

Ensilage Cutters and Blowers

Ensilage cutters with 14 in. throats are being operated with motors as small as 3 hp. Many silos are filled with 5 hp motors. Conditions must be right for successful use of 5 hp or smaller motors. Do not run the cutter any faster than necessary to blow in the silage. Most of the power is taken by the blower; not the cutter. Sharpen cutter knives once or twice a day. Set knives as close to shear plate as possible without striking

it. Use 4 in. flexible belt. Have delivery pipe straight up and down. Feed uniformly.

Unless you have other uses for the motor or must use the tractor for other work, it will seldom pay to have a 7½ or 10 hp motor and the necessary wire and transformer for silo filling.

Blowers for elevating chopped hay and silage may be operated with 5 hp motors if properly speeded. Elevators or conveyors use much less power than blowers for the same tonnage handled.

Heat for the Milk House

There have been some new developments in milk house heating in the past year.

Industrial, **fan type heaters** with adjustable thermostatic control have become popular with many dairymen. These heaters are made in sizes of 2 kw up. They are suspended from the ceiling and warm the room by circulating heated air. Made especially for milk houses but adaptable to shops, room heating.

In Wisconsin a number of dairymen are using small **hot water radiators** with circulating fans. The hot water is taken from the dairy water heaters which are on a low off-peak rate. In insulated milk houses the results have been good. You must be sure the water heater is large enough to supply room heat and still have water hot enough for utensil washing to satisfy the dairy inspector. Check with your rural service man before attempting such an installation.

The latest in milk house heating is the use of the milk cooler compressor as a **heat pump**. By running well water through the cooling tank, the air-cooled compressor and condenser act as heaters for the house. See House Heating, Section 7, and Refrigeration Sec. 13.

Portable radiant heaters and heat lamps may also be used for spot heating in milk houses. The radiant heaters have 660 and 1000 watt elements; heat lamps 150, 250 watts and up. Never touch the radiant heaters with wet hands because of possible shock. Water must be kept off heat lamps to prevent breakage, except those made of special glass. Point the heaters at the spot you want warmed. They are not as good as other heaters for warming the whole room.

Hoists for Milk Cans

A number of farmers have rigged up hoists for lifting milk cans into

Say Mr. Farmer...

Do you have the OLD LOOK?

or the NEW LOOK?

If you roll up your pants legs every day, climb into knee-high boots and spend hours of valuable time wading your way through back-breaking barn cleaning chores, it's time you traded that *old*, tired look for the NEW.

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Throw away that shovel and broom! Save time! Save money! See your Crown Dealer or write for full details today!

CROWN Push Button Equipment FOR BETTER FARMING

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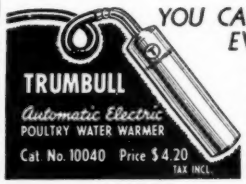

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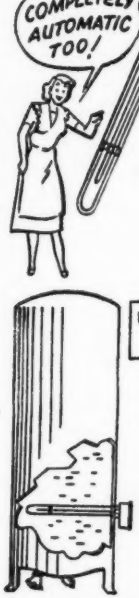

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SIMPLY SCREWS INTO YOUR WATER TANK

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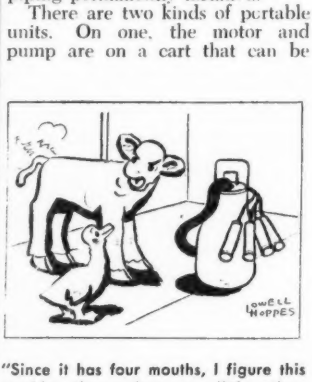
and out of milk coolers and onto trucks. Some are motor operated; some manual. One dairy manufacturer builds a vacuum hoist which operates on the milker vacuum. It has been very satisfactory. Factory type conveyors have been used by some farmers.

Milkers

Milkers are of two types: portable and pipe-line. **Portable units** cost less. They are especially adapted to small herds and for tenants who may move. Pipe-line units have the pump, motor and piping permanently installed.

There are two kinds of portable units. On one, the motor and pump are on a cart that can be



"Since it has four mouths, I figure this machine throws four poor little calves outa work!"

wheeled and plugged into outlets behind the cows. The milker units are similar to pipe-line units. The other kind has the pump, motor and pulsator on top of the pail.

Pipe-line units are also of two types. In one, the milk is drawn into a single or double unit milker pail. In the milking parlor type the milk passes from the cow into a receiver, then through a pipe directly into the milk house.

Glass milk pails have come on the market during the past year.

Costs vary from around $150 for small portable milkers to as much as $2500 for elaborate receiver types. Pipeline pumps use motors of ½ to 3 hp; portable milkers ¼ or ⅓ hp.

Advantages of milkers are, saving of labor, substitution for labor that is not available, ability to handle more cows, cleaner milk.

Proper preparation of the cow is essential. **Fast milking**—3 to 4 minutes per cow—should always be practiced. It saves time and cuts down udder troubles. Massaging the udder with towels wrung from 130° water stimulates milk flow. Cleanliness and sanitation in washing and sterilizing equipment is necessary. It is not burdensome if done right and regularly.

Power used in milking averages 2 kw-hrs per cow per month.

In case of a power outage some farmers have belted the vacuum pump to the farm tractor through a hole in the barn wall; other farmers in Ohio are reported to have connected the intake manifold of the tractor to the pipe line to provide a vacuum.

Milk Coolers

There are four common systems of cooling milk electrically. 1. By immersing cans in flowing, pumped well water, or flowing the water over the cans. 2. By immersing cans in mechanically refrigerated water or calcium chloride brine. These cooling tanks may or may not have agitators for keeping the water in motion around the cans, or pumps for holding the cooling water at can neck level regardless of the number of cans in the tank. 3. A new type cooler refrigerates the water and sprays it over the cans in a front opening cabinet. The cans are not immersed. 4. By passing the milk over a surface cooler through which refrigerated water or brine or refrigerant is pumped.

Well water and wet coolers for milk cans are used almost exclusively for milk sold in cans.

For market milk it is highly desirable to get the temperature down to 50° or lower within 2 hrs after the milk is drawn.

Surface coolers are now quite largely limited to dairies selling bottled milk. They cool milk quickly, but require careful washing and sterilization.

Wet coolers are made in sizes of 1 to 16 cans. Compressors range from ¼ to 2 hp. Power used is about 1 kw-hr per 10 gallon can.

Electric (mechanical) cooling is faster, and cheaper than cooling with ice water where ice must be purchased. It eliminates the labor and mess of handling ice. Where milk must be cooled, the electric milk cooler is one of the best paying investments on the farm.

Bulk Cooling & Handling

A new system for cooling and handling market milk is now being tried out experimentally. The farm is supplied with a stainless steel mechanically refrigerated tank. Milk is placed in the tank from the milker pail. The milk hauler samples the milk and drains it into his refrigerated tank by vacuum. Cans are eliminated.

Milk Pasteurizers

Three companies are now manufacturing small electric milk pasteurizers for home use. They hold from 1 to 2 gallons of milk and sell for $30 to $70. Two pasteurize in bulk; one in quart jars. They plug into 115 volt convenience outlets. Temperature controls are automatic.

For the small dairy producing 10 to 20 gallons of milk per day, there are no electric pasteurizers available. Manufacturers are doing experimental work on them.

A committee made up of representatives of the US Public Health Service, USDA, colleges, manufacturers and others are at work trying to figure out a new formula for pasteurization which will protect the public and at the same time make these small pasteurizers simpler and eligible for Health Department approval.

Standard batch pasteurizers of 40 gallon size or larger use either hot water or steam for pasteurizing. Either can be produced electrically in large storage water heaters or steam accumulators. Some such installations have been made.

Separators

Most cream separators today are available with electric motor drive. They include both table and floor models. Motors of ¼ hp turn them. If not equipped with motor when sold, most of the separators are made so that a motor drive may be added. It involves extending a high speed shaft through the housing to which a drive pulley may be attached. Separators without this provision may also be converted to motor drive if pulleys are adjusted so the drive belt will slip until the separator comes up to speed.

Electric drive does better separating. Separating efficiency depends on correct and uniform speed. The electric motor has this.

Silo Unloader

Silo unloaders have now been on the market long enough to demonstrate their reliability. The mechanism is supported above the ensilage by three cables and is lowered daily by the depth of silage to be taken out. A rotating collector arm scrapes the ensilage to the center where it is picked up by a simple mechanism and delivered into the silo chute. It will deliver frozen silage. Driven by a 3 hp motor. Operated from the barn floor, except for a trip, into the silo about once in ten days to lower the delivery pipe. The dispenser may be moved from silo to silo as emptied.

Utensil Sterilizers

Some city health departments and some state health departments require the sterilization of milk utensils. Whether required or not, sterilization improves milk quality by cutting down on bacteria introduced.

In the East the **controlled steam sterilizer** is most common. It consists of a front opening metal cabinet with racks for the utensils. In the bottom are metal enclosed electric heaters. Utensils are put in the cabinet wet from the rinse water. The door is closed and electricity turned on. The heat evaporates the water and fills the cabinet with steam. The electricity is cut off automatically. The sterilizers are made in 4 to 9 can sizes using from 1 to 5 kw. Power consumption is 3 to 4 kw-hrs per 100 lbs of utensils sterilized.

On the West Coast, steam cabinets are used. Steam is supplied by electric **steam accumulators.** These accumulators are similar to large heavily insulated water heaters. They have low wattage heating elements that superheat the tank of water to about 260° F and 20 pounds pressure. The 1 to 3 kw heating elements are of such size that the tank is heated and the current cuts off about an hour before milking time. When the sterilizer valve is opened, the superheated water flashes into steam, filling the cabinet. A mixing valve is also provided to mix superheated with cold water for utensil washing.

Ventilation of Dairy Stables

Electric ventilation accomplishes several things. 1. It saves barn timbers and siding from decay. 2. It provides a drier, more healthful atmosphere for the cows and helps maintain milk production. 3. It produces much better working conditions for the men. 4. It saves paint, piping, and wiring. 5. It eliminates drafts.

Fans of 1/20 to ¼ hp draw air out of the stable from a point or points near the floor. Fan capacity should be 60 cu ft per minute per 1,000 lb cow or six changes of air per hour in the stable. Intakes may or may not be used, depending on stable construction. Where used, intakes are provided around the stable to deliver air upward against the ceiling without draft. Intakes should be about 60 sq in. in cross-section, with one for each four cows. Fans can run continuously throughout the winter or be controlled by thermostats and speed reducers in exceptionally cold weather. Results in cold climates have been excel-

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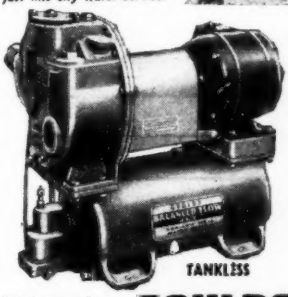
"Our Balanced-Flow gives me a full stream of water from every faucet even if they're using water outside. . . . It's just like city water service!"



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GOULDS
Balanced-Flow JET
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"High production? You bet—now that there's plenty of fresh water for me."

Amazing because it's *tankless,* with self-adjusting capacity. Furnishes really *fresh* running water in the quantity desired, at one or *more* outlets, up to the pump capacity (540 gallons an hour). Simple, compact, yet trouble-free and efficient. There's only one moving part!

BE SURE TO GET A PUMP BIG ENOUGH

For more water, or for deep well use, see Goulds famous Jet-O-Matic. Wide range of capacities and pressures . . . same unit for deep *or* shallow wells. It's another farm-proven member of the Goulds line, backed by more than one hundred years of pump manufacture.

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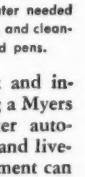

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lent. System can be installed when barn is full of hay. Installation costs from $50 up; average from $3 per cow for medium herds. Power consumption about 2 kw-hrs per cow per month.

Water Heaters

See Water Heating, Section 15 for discussion of different types of available water heaters.

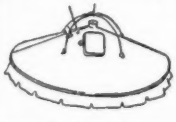
During the past year field studies were made in Pennsylvania and New York on the size water heaters which were best answering the needs of dairymen. There is an increasing trend toward heaters of 40 to 80 gallons in size. The larger sizes were common where off-peak rates were in effect.

Section 9

Poultry Production

Brooders

The chief advantages of electric brooding are care-free operation, automatic controls, less fire hazard, better feathering, economy.



Any brooder should provide at least 7 sq in per chick; 10 sq in is better. Brooder insulation is important. From 1½ to 2 watts per chick should be provided in heaters.

Many kinds, styles and sizes of electric brooders are on the market. All will brood good chicks if given the attention required.

The important thing is to *learn how to use your brooder* correctly. Electric brooding methods are entirely different from those used with fuel brooders. Learn them if you want to save labor and get good results.

Most brooders have the heat supplied to the chicks from above. At least one underheat brooder has been on the market and many have been built by poultrymen. In some, soil heating cable has been used on the floor with radiant heat above.

Heat lamps hanging above the chicks without hovers have been tried experimentally. The cost has been higher and results not good enough to establish the method.

Outdoor hovers with screened floor or grass runs have been used successfully in the South and West.

Battery brooders with one unit above the other are used largely for raising broilers and for starting chicks. They have not been popular as farm brooders.

Any brooder house should have tight, warm double constructed floors without floor drafts. The Ohio Experiment Station has found deep litter effective in brooding chicks. Litter has been used by as many as six different broods of chicks. Deep litter helps to keep dry, warm floors. Used litter did not increase disease and chicks seemed to grow better on it.

Caponizing Instruments

With electric caponizing instruments the cockerel is emasculated and the wound cauterized at the same time. Many operators prefer the electrical method.

Conveyors—Litter and Feed

Drag-chain grain and baled hay elevators and rubber belt conveyors have been used by some poultrymen in conveying litter from houses into wagons; also for handling baled litter and sacks of feed. At least one manufacturer is now building an aluminum conveyor with fractional horsepower motor for this purpose. It can be handled by one man.

Cleaners—Dropping Board

Dropping board cleaners of the scraper type operated by a ¼ hp motor have been used experimentally. So far as we know, no one is selling them at present.

Cutters—Green Feed and Litter

Where green alfalfa, kale, rape or grains are fed to birds in confinement there is less waste where the green stuff is chopped. Small hand choppers may be motorized to do this job and to chop straw for chick litter. Use motors of ¾ to 1 hp. They save much labor.

Debeakers

These small electric devices costing about $15 to $30 are used to cut about ⅜ in. off the upper mandible of a chicken. The de-

beaker cauterizes the wound as it cuts. There is little bleeding and the wound heals quickly. The purpose of debeaking is to stop cannibalism. It also helps prevent waste of mash from hoppers. The same device is used for clipping wings of chicks.

Dressing Plants

Complete electrically operated dressing plants are available. They have continuous chain conveyors on which fowls are hooked. They are first electrocuted to release the feathers, then bled, scalded for a predetermined time, carried over the picking table, then chilled in cold water.

Egg Cleaners

During the past year Cornell University announced a new method and machine for cleaning eggs. The principle involved is the use of 165° water for washing. Abrasive coated cloth discs rub off the softened dirt. It is claimed that the keeping quality of the egg is not lowered if the water is used at the right temperature.

Standard dry egg cleaners use motor-driven abrasives to remove spots of dirt. Most of them may be attached to the shaft of a ¼ or ⅓ hp motor. Some use sand paper abrasives. One uses a buffer wheel with a cleaning compound. Cost under $10.

A new dry egg cleaner has just been announced. It is automatic and has a capacity of up to 1800 eggs per hour.

Egg Graders

These motor driven machines separate eggs into different grades by weight. Several types are made. Some machines have built-in candlers.

Egg Coolers

Egg coolers may be either electrically cooled refrigerators or evaporative coolers with an air blast. The purpose of cooling eggs in the summer time is to remove the animal heat quickly and hold the egg at a temperature of around 55° until marketed to avoid deterioration. It is best not to cool the eggs much below 55° or they will sweat when removed.

Fans directed on eggs in wire baskets in cool cellars will help to remove the animal heat quickly.

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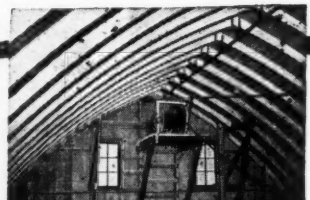

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try houses are common, elevators for moving feed, litter and eggs up and down are becoming increasingly popular. Standard small electric freight elevators may be used. A number of poultrymen are using electric chain hoists. The hoist, complete with motor, brakes and control is hung in the top of the building. Timbers are erected as guides for the elevator cage.

The elevator is hooked to the hoisting chain. Two weighted control ropes hang from the hoist. Pull one to raise, the other to lower. The hoists are made to lift 250 to 2000 pounds with ¼ to 1 hp motors. They hoist at 11 to 34 ft per minute. Cost from about $175 to $500.

Single-drum farm hoists have been rigged up to operate elevators. With them a spring controlled stop at each floor provides a safety device and a leveling arrangement. The stop snaps into place after the elevator platform has passed above it. The platform is then let down on the stop.

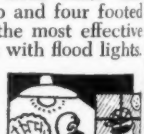
Where safety codes are in force, operators are not permitted to ride on such elevators.

Incubators

Practically all large incubators have electric heat controls and air circulation. Most of the small and medium sized incubators are heated electrically. Electric incubators are available in sizes of 50 eggs and up. The advantages of automatic operation and uniform heat and moisture control are so obvious as to need no comment.

Protection for Poultry

Turkeys on open roosts often need protection from foxes and skunks of the two and four footed variety. One of the most effective methods has been with flood lights. Lighting the roosts and surrounding area with floodlights placed at some distance seems to have given the best results.



If lights are concentrated on the roosts, animals may scare the turkeys off the roosts into the shadows and kill them. Electric fences have not been too satisfactory in keeping predators away.

Lights for Egg Production

Lights are used for stimulating winter egg production of commercial flocks, for bringing pullets into

laying faster and for the regulation of production of hatching eggs when wanted. Lights are also used to stimulate growth of chicks.

It is now generally accepted that lights produce a direct stimulation and not just a longer feeding day.

In lighting turkeys for early egg production, the toms should be lighted several weeks before the hens.

Standard poultry house lighting installations consist of 40 watt lamps in RLM or flat dome reflectors spaced 10 ft apart, 6 ft high and half way between the front of the house and front edge of dropping boards. The total hours of light should be 13 to 14. If the lights are used in the morning, no dimmers are necessary. If used in the evening, some method of dimming the birds onto the roosts is necessary. **Electric time switches** are available for controlling the lights. Some poultrymen use 15 or 25 watt lamps and keep them on all night. Sudden stoppage of lights may throw hens into a moult.

The time of year to turn lights on depends on the price of eggs as well as the hours of darkness. September eggs prices are often highest.

Poultry Pickers

Poultry pickers have flexible rubber fingers about 4 in. long set in the outside of a motor driven drum. The smallest size has 28 picking fingers and is driven by a ½ hp motor. Standard size models have 170 to 315 fingers on drums that rotate at 250 to 450 rpm, driven by ½ to 1 hp motors. Chickens are picked at the rate of 40 to 200 per hour. Feathers are rubbed off. The machines sell for $100 to $500. Power consumption is ½ to 1 kw-hr per hundred birds picked. Electric pickers are almost universally used now in poultry dressing plants.

Scalders

Electric scalders hold the temperature of water constant at a semi-scald point (128°-130°) for dressing poultry. They consist of insulated containers of galvanized iron, copper or stainless steel with heating elements of 1000 to 3000 watts and thermostatic controls. They insure uniform scalding without injury to or discoloration of the skin.

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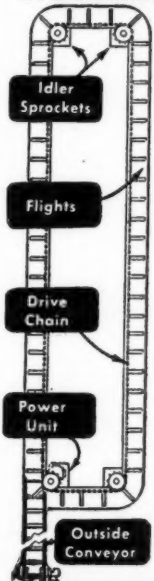

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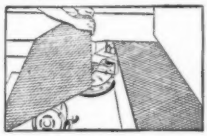

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Ultra-Violet

The Nebraska Experiment Station has found that Sunlamps of the S-1 or S-4 type will take the place of cod-liver oil in providing vitamin D, and in improving the hatchability of eggs.

Sunlamps should be placed not more than 6 ft. from the floor, and preferably over the feed hoppers or water pans. Four hours exposure per day is sufficient. Use one lamp per 100-150 birds.

Bactericidal lamps (Germicidal or Sterilamps) have proved themselves to be effective in killing germs in the air and on surfaces receiving the rays. They do not take the place of Sunlamps. They do aid in farm sanitation. See Ultra-Violet, Section 11.

Ventilation of Poultry Houses

The same principles apply as in dairy barn ventilation. Fans should have a capacity of 1½ to 2 cu ft per min for each bird housed. Fans of 6 to 9 in. diam powered by 1/40 to 1/20 hp motors are commonly used. Be sure the fan you buy will move the right quantity of air. The operating cost is very low. When properly installed with intakes well placed, they help in keeping the house dry and sweet and save litter. Air should be discharged from near the floor and intakes directed toward the ceiling to prevent drafts. Warm floors and deep litter should go with ventilation.

Waxers

Waxers are used in the final cleaning of picked ducks, turkeys, etc. A special wax is used. It is liquified in a container surrounded by an electrically heated water bath. Picked fowls are immersed in the wax then dipped in cold water. The wax solidifies. When cracked off, the pinfeathers, and hair, come with it. The wax is heated in a remelter, strained and reused. Waxers are similar to scalders but with an inner container.

Feed Grinders, Corn Shellers and Crackers and Feed Mixers, Cob Crushers, Alarms

See Section 7.

Section 10

Honey Production

The production of honey goes, along with the production of certain fruits and seeds. The bees are essential for pollinating the blossoms.

Hive Heaters

Hive heaters are new. They consist of a low wattage heating element (under 100 watts) and a heat control to be placed in the hive. They are used for wintering bees in cold climates and for producing and protecting strong early brood for building strong colonies. Similar in principle to brooding chicks.

Honey Extractors

Motor driven centrifugal extractors are standard equipment. They use motors of ¼ to ½ hp.

Honey Heater and Bottler

A homemade device consisting of a 50 gal drum in an electrically heated water bath. The outer water tank is insulated and provided with a 5 kw immersion heater. Honey is thinned, strained, and bottled through a faucet.

Honey Liquefier

An electrically heated, insulated plywood oven with galvanized iron lining. Temperature held at 140° to 160°. Sugared honey in containers up to 5 gal size is liquefied overnight. Holds 300 pounds. Has 1200 watt heater.

Electric steam boilers are also used for liquefying honey and in cleaning honey utensils.

Uncapping Knives

These electrically heated knives are used for removing caps from honey to be extracted. Experimental work has also been done with rotating hammer-mill type uncappers which will open the cells with less waste and mess.

Section 11

Light; Infrared; Ultraviolet

Visible Light

Farm Lighting Design

Books and many bulletins have been written on proper design and placing of lamps for good seeing. Three things are involved in seeing. First is the eye. Next is the object, its color and its surroundings. Last is the light on the object. It is harder to distinguish details of a dark object against a dark background. It takes more light. Dark ceilings, walls, floors and furnishings absorb light. It takes more light to illuminate such a room.

A good rule to remember is to distribute light in much the same way you do water with a hose. If you want to spread the light out over a room, use a lamp and reflector that will "sprinkle" or diffuse it. If you want a beam to reach out to the turkey roost, use a "nozzle" or reflector that will concentrate into a solid stream. Keep in mind that the light should be directed onto the object you want to see and not into the eyes of people trying to see it.

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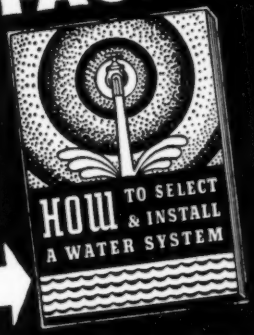

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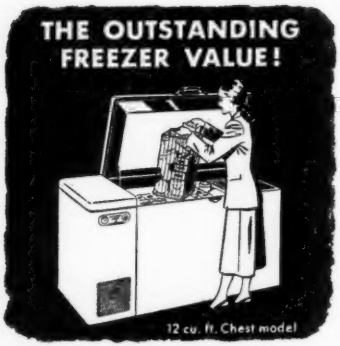

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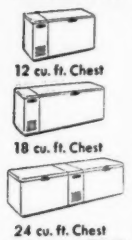

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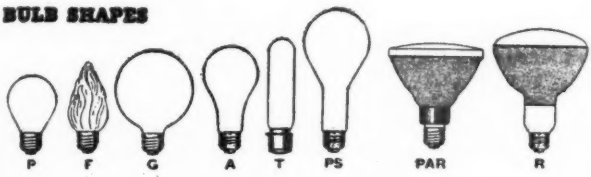
Lamp Bulb Descriptions

Lamp manufacturers have adopted a method of specifying the shape and size of incandescent and fluorescent lamps. The designation consists of letters and figures. The letters indicate the shape of the lamp, and the figures, the diameter in eighths of an inch. Here are the shapes.

A—The common shape of today's household lamps.
F—Flame shaped.
G—Globular.
P—Pear shaped.
PS—Pear shaped with straight neck.

BULB SHAPES



PAR—Hard glass reflector or projector type for outside use.
R—Reflector shaped lamps with inside reflecting coating of aluminum.
T—Tubular.

Examples: An "A-20" lamp is the common lamp shape, 20-⅛" or 2½" in diameter. An "R-40" is a reflector type lamp 5" in diameter. A "T-8" lamp is a tubular lamp 1" in diameter.

For complete lamp specification, the type, wattage, voltage, color, types of base, etc., must be given.

BASE DESIGNATIONS

Incandescent Lamps

Incandescent lamps consist of a glass bulb containing a tungsten wire filament which is heated by electricity to white heat (incandescence) to produce the light.

Standard incandescent lamps are now made in the following wattages: 6, 10, 15, 25, 40, 60, 75, 100, 150, 200, 300, 500, 750, 1000, 1500. They are available for use on circuits of several voltage ranges. The 120 v lamps are most common. Lamps of many other types and sizes may be obtained on order.

Lamps of 25 watts and smaller are vacuum type; sizes larger than 25 watts are filled with an inert gas. Here are some differences in them. Vacuum type are cool when lighted; 93-94 percent of the heat given off is radiant heat; the bulbs darken all over as they get old. Gas filled are hot when lighted; 70 to 87 percent of the heat is radiant heat; the necks darken if burned bulb down or the bulbs darken if burned bulb up. The darkening is caused by small particles of the tungsten filament vaporized by heat during the life of the lamp.

The average actual hours of burning for which most lamps are designed is 1000 hours. That assumes using the lamps on the voltages for which they were designed. You will get more light per dollar invested in lamps and kw-hrs combined, if lamps are used at rated voltages. (See Lighting Economics).

If a 115 volt bulb is used on a 120 volt circuit the life of the lamp is decreased but the amount of light given off is much increased. Also, because of the higher efficiency at higher voltage the electricity used per unit of light is less. If used on a 110 volt circuit, the lamp lasts longer but the light is considerably reduced and the electricity costs more per unit of light. Specifically a 1 percent increase in voltage gives about a 3 percent increase in light output, or a 1 percent decrease in voltage reduces the light output 3 percent.

Reflectors, Enclosing Globes, Shades, Wall Tints

Reflectors are used for directing the light where you want it and reducing waste of light. For use in and about farm buildings they are of the dome and shallow bowl types. Dome and shallow bowl reflectors give a wide distribution over flat surfaces like a poultry-house floor. Projector types are used for spot-lighting and flood-lighting. White porcelain has excellent light reflecting properties and is easy to keep clean. Polished metal or porcelain is good for reflecting heat. Aluminum should always be used to reflect ultra-violet. Reflectors *must be kept*

clean or they lose their efficiency.

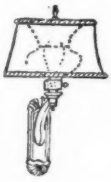
Enclosing globes of white glass or similar material are used to diffuse light and reduce glare. Standard lamps are frosted on the inside for this same reason. The enclosing globe is added because the larger the light source, the less the glare and the softer the shadows—Better seeing.

Shades on lamps direct the light to where it is wanted and at the same time act as diffusers for the direct rays. Shades that are white or light colored on the under side reflect the most light. Light colored or translucent shades permit a soft glow to illuminate the room. Heavy, dark colored, ornate shades are of doubtful decorative value and of no other value. Flaring shades spread the light better than straight-sided shades.

The color and texture of **wall coverings, paints, floor coverings** and furnishings have much to do with effective lighting. Light colored linoleums and wall paints are best for kitchens for either day or night lighting. They can add 50 to 75 percent to the effective illumination with the same light sources.

Certified Lamps

Certified lamps are new. They are designed to give the best in illumination. Made in floor, table and pin-to-wall types, 60% of the light is directed down on work surfaces and 40% upward for indirect lighting. The improved lighting is due to the make and construction of the diffusing bowl, reflector and shade.



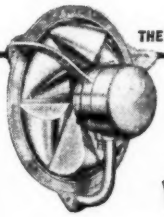
Fluorescent Lamps

Fluorescent lamps are of the tube type. Light is given off by a powder coating on the inside of the tube which glows when activated by ultra-violet waves. The ultra-violet is produced by a flow of electricity through mercury vapor within the tube. The lamp requires special auxiliaries consisting of a starter and a ballast which are made a part of the fixture.

Fluorescent lamps produce 2½ or 3 times as much light per unit of electricity as incandescent lamps. They are cool to the touch. They produce whiter light and are also available in various shades of color. They produce a less glaring light with softer shadows. The continuous use life is about three times as long as incandescents but is shortened by frequently turning the lamps on and off. On the other hand, fluorescent lamps cost several times as much as incandescent lamps. They do not start well or operate at full efficiency in cold rooms or out of doors in cold weather. The cost of fixtures and auxiliaries is relatively high. Auxiliaries as well as lamps have to be replaced. The lamps may create static in nearby radios. The quality of some fluorescent light, being different from incandescent light, may change the appearance of foods, draperies, dresses, complexions. In factories and large commercial establishments where many lamps are used, fluorescents may save on lighting costs. On farms the total cost of light would probably be about the same as for incandescent lights. The kitchen and work shop are the most favorable places for fluorescents at present.

Cold Cathode Fluorescents

Cold cathode fluorescents similar to Neon tube lights are being used to a considerable extent in store and industrial lighting. They have a long lamp life, may be used outside at low temperatures; start instantly. Not standardized to same



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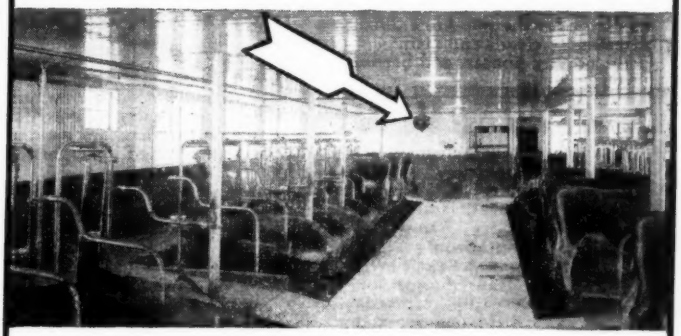

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extent as hot cathodes for home or farm use.

Lighting Economics

We install lamps to see. The part electricity plays in seeing is providing the light. So we should consider that we *buy light*. To get the most light for our money, we must have properly designed fixtures, correctly placed, have suitable reflecting surfaces on walls, ceilings and floors and use enough lamps and electricity. Once the lighting units are installed, the cost of light is the cost of lamp replacement plus the cost of electricity used. Take a 60 watt incandescent lamp that costs 12c. In its 1000 hours of burning it uses 60 kw-hrs costing perhaps $1.20. The cost of the light is about one-tenth for the lamp and nine-tenths for the electricity. The lamp decreases in efficiency with use, so that by the end of 1000 hours you would save money to replace it even if it did not burn out.

Dirty lamps and reflectors run up the cost of lighting 50 to 75 per cent. Dirt on a lamp may reduce its light output one-half or more.

Yard Lights

Yard lights for doing winter chores, for welcoming visitors, for discouraging prowlers, are some of the most appreciated lights on the farm.

Pointers on yard lights: A light directly over the top of a pole casts no shadows. A light out from the corner of a building lights two sides of it. The higher the lamp, the wider the distribution of light. You can see objects between you and the light better than those beyond the light. Frequently farmers install lamps that are too small; 300 watt lamps are not too large. They are not on for many hours, so the operating cost is low. Protect lamps from rain breakage either with suitable reflectors, or by using hard glass reflector type lamps. Be sure the lamp is located where you can replace it easily with *your ladder* placed against a solid support, or from a window or special small door in the building wall. Have the bracket support *solid* or the wind may vibrate it so the lamp will work loose. Inexpensive rubber sealing rings made for use with weatherproof sockets help to hold the lamp in the socket and seal out the water.

Yard Light Controls

Yard lights (or other lights or devices) may be controlled by switches from several different points. It may be done in the usual way with 3-way and 4-way switches, or by means of relays which have been placed on the market during the past few years. The 3- and 4-way switches call for 3 or 4 115 volt wires between switches and lights. The 24 volt relays use only two wires, and they may be twisted bell or telephone wires. Push-buttons are used instead of regulation switches. One relay will control a number of lights that are to be turned on or off at the same time. Any number of push buttons may be used. The relays cost around $25. They permit a considerable saving in wiring.

Insect Repellent Lamps

Lamps do not repel insects. The so-called repellent lamps are stained yellow. Insects do not see yellow, so they are not attracted to the lamps as they are to white or blue light. Another way to keep insects away from you in the open is to place a flood lamp up in a tree and aimed toward you. The insects will fly to the lamp instead of to you.

Ultra Violet

There are different qualities of ultra-violet just as there are different colors of light. The quality of ultra violet depends upon its wave length. Wave lengths are measured in Angstrom units. An Angstrom unit is about four billionths of an inch long. Pretty short! Black light lamps produce waves of 3200 to 4000 Angstroms; Sunlamps, 2800 to 3200 A; germicidal waves have their greatest killing power at 2537 A; ozone is made by waves of about 2000 A. A Sunlamp is not suitable for killing germs and a germicidal lamp is not intended for producing vitamin D. Practically there is some slight overlapping of wave bands in each of the lamps.

Sunlamps are used on humans and on livestock to produce effects similar to the sun. Vitamin D is a product. Safe exposure to the lamps without excessive sunburn must be learned by trial. Start

with, say 10 to 15 minutes at 3 feet. If the distance from the lamp is cut in half, the sun-burning effect will be four times as great. Protect human eyes from direct radiation.

The S-4, RS-4 (125 watt), and the S-1 (500 watt) Sunlamps require special transformers costing up to $25. The S-4 lamp has largely replaced the S-1 because of its efficiency and lower wattage. A recently available 275w RS type lamp has the starting auxiliaries within the lamp itself and may be used directly on 115 volts. It costs about $10. Carbon arc lamps are also available for home use.

There have been some favorable reports on the use of Sunlamps for promoting health in cattle. Other reports have said there were no observable effects. See also Section 9, Poultry Production.

Germicidal and bactericidal lamps and Sterilamps have demonstrated conclusively their ability to kill germs, molds and bacteria in air and on surfaces hit by the rays. The rays do not penetrate beneath the surface. At present the most effective use of the rays is in killing germs in the air and in providing a "screen" of rays through which germs cannot pass alive. Germicidal rays produce painful but not permanent eye irritation in humans and animals. The rays should be shielded so they will not enter the eyes directly.

Germicidal lamps are practically identical with fluorescent lamps, except that the germicidals are in special ultra-violet transmitting tubes that contain no fluorescent powder. The same fixtures may be used for both types. Aluminum reflectors should be used for all ultra-violet.

Ordinary window glass stops ultra-violet waves. Glass is an effective stopper for either germicidal or therapeutic rays.

Infrared

Infrared waves are heat waves. The shorter ones penetrate short distances beneath the surface and are therefore effective for heating nerves and muscles, for drying paints, etc. Short heat waves from the sun penetrate hotbed glass or your auto top and glass. Inside they are absorbed and changed to long wave heat. The long waves cannot pass back through the glass or top.

About 85 percent of the electricity that goes into ordinary incandescent lamps is changed into infrared heat waves. Ordinary lamps are therefore good, cheap sources

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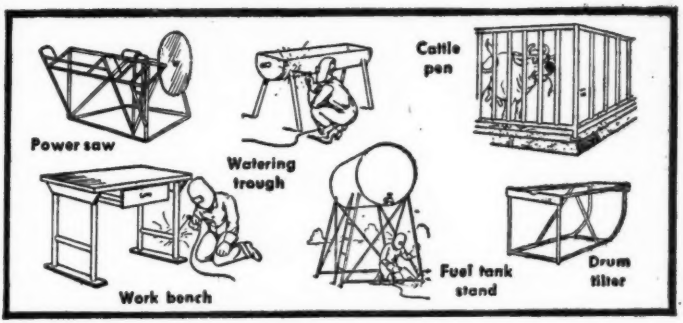

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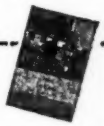

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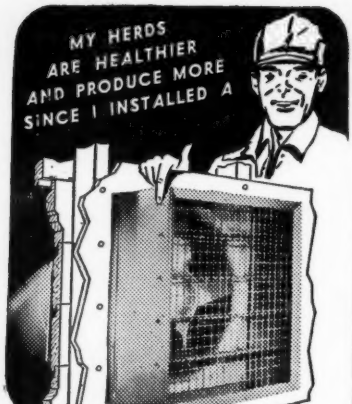

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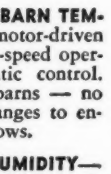

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of infra-red. Special infra-red heat and drying lamps are almost identical with common incandescent lamps except that the filaments are heavier and do not glow as brightly. The lamps also last about five times as long. They are desirable where intense light is not wanted.

Lamps may be used as heaters in a number of places on the farm. They are used in some chick brooders, in pig and lamb brooders, in hot beds, to keep poultry fountains and small pump houses from freezing, to warm the car engine in winter, for a small amount of heat in the milk house. Penetrating infra-red is being used increasingly for relief of pain, soreness in muscles, inflamation or wherever heat is required.

Section 12
Motors, Contols and Protection

IT IS a safe guess that more than half of the appliances used on farms are motor operated. Refrigerators, mixers, ironers, electric clocks, fans, vacuum cleaners, shavers, milkers, milk coolers, water systems, clippers, freezers, brooders, barn cleaners and hay finishers are some of them. They are of different types, designs and speeds. Some use direct current, some alternating, some either kind. When you buy motors or equipment, it is essential that the motor be of the right kind to use on the type current you have.

Types of Motors

Most farms have only single-phase, alternating current service available. Motors must, therefore, be of the single phase, alternating current types. Direct current or polyphase motors will not run on single phase, alternating current electricity and the motors generally cannot be rebuilt for such use.

Direct current motors are used in industry, on 32 v lighting plant circuits and in automobiles. Not usable on 115 v, alternating current.

Three phase motors are lighter, cheaper and smaller than single-phase motors of the same speed and horsepower. They require special wiring and 3 phase line service. They can be used only on three phase circuits.

Universal motors are commonly used on vacuum cleaners, sewing machines, portable tools and small motion picture projectors. They run on either alternating or direct current, have power to start heavy loads, are high speed and light in weight. Speed varies widely depending on the load.

Single Phase Motors

All **single-phase motors** run in pretty much the same way, once they are up to speed. Differences in construction are in the methods of starting and getting the motors up to their rated speeds. They also have different efficiencies due to amounts and kinds of materials and design.

Repulsion-Induction motors are most widely used for starting heavy loads. They are made in fractional horsepower sizes, but their greatest use is in sizes over 1 hp. They are good general purpose motors.

Capacitor start motors are becoming increasingly popular, particularly in the smaller sizes. They start well under medium heavy loads, create no radio interference. Good general shop motors in fractional horsepower sizes. They are made in sizes up to 5 hp.

Split-phase motors are limited almost entirely to sizes under ½ hp. They are not recommended where they must start heavy loads. They also cause flickering of lights on the line in starting. Many of them are sold because of their low price. They are satisfactory on easily started machines.

Fan motors are often of the **shaded pole** type, a less costly way of providing a starting mechanism. They have low starting power. They are suitable on small fans which do not require much power until they are up to speed. Operating speed varies with load.

Cycles. Electricity supplied on rural lines is practically all 60 cycle. In some sections 50 cycle is used, and in a few, particularly in Canada, 25 cycles. Motors of one rating cannot be used on lines of a different rating.

Speeds. Sixty cycle motors are designed to run at 900, 1200, 1800 and 3600 rpm. The slower speed motors are heavier and cost more. All are equally efficient. The 1800 rpm motor is the one most com-

monly used. It may be listed as 1725, 1740 or 1760 rpm. That is its speed when fully loaded.

Voltage. Motors are often rated at 110-120 volts or 220-240 volts. That means they will run satisfactorily at any voltage within that range.

Most motors have their windings so designed that a 115 v motor may be used on 230 v circuits by making a simple change in connections in the connection box on the motor. Similarly, a motor used on 230 v may be connected for 115 v. If your motor is of that type, it will be marked 115-230 v on the nameplate. A connection diagram is usually given on the nameplate or attached to the wire terminals. Split phase motors are built for one voltage only.

Reversing Motors. Repulsion-Induction motors may usually have their direction of rotation reversed by shifting the brushes. There will be marks on the brush ring.

Most other types of motors can be reversed by changing connections in the terminal box on the motor. Not all motors are reversible.

Choice of Motors. In addition to the factors named, there will be differences in motors of the same type made by different manufacturers or made for different uses. Some are for short periods of use; some for continuous service. Some split-phase motors have centrifugal starting clutches. There are different oiling systems, different bearings, different types of frames. Some have built-in over load protection. Some use a much heavier starting current than others. At additional cost you can get variable speed motors or back-geared motors for slow speeds. You usually get what you pay for, *but* it is well for you to know what you want the motor to do before you buy it. It may save you money.

Motor Starters, Controls, Protection

Most motors are started by merely closing a switch. With motors of several horsepower or larger, a quick closing switch is desirable to prevent arcing. A magnetic switch performs this function. You close a circuit with a push-button and the magnet snaps in the motor switch. The push-button for starting may be at the motor or any

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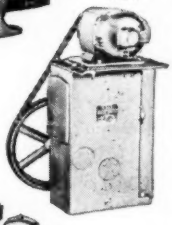
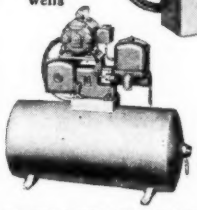
For deep wells



For shallow wells



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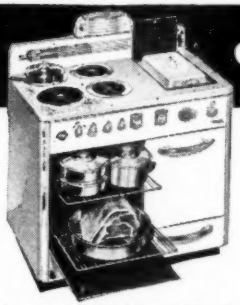

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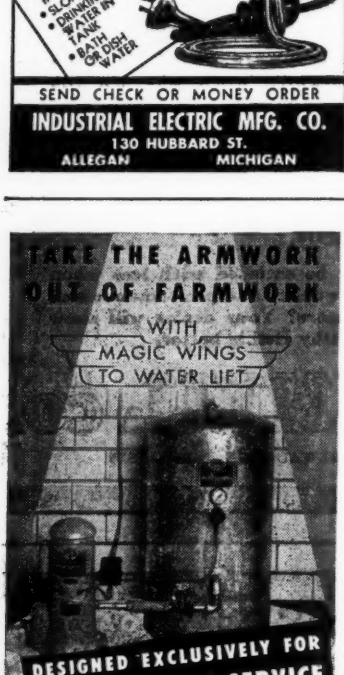

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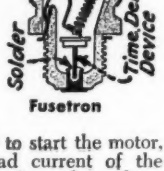
distance from it; or a thermostat or pressure switch may be substituted for the push-button.

With some large motors that start under heavy load, it is desirable to use a controller that starts the motor under reduced voltage.

A fuse in the line supplying the motor *protects the wire* in that line from getting too hot due to overloading. It does not protect the motor. The reason the fuse does not protect the motor is that it must carry 3 or 4 times the running current in order to start the motor, and the overload current of the motor should be limited to about 1¼ times the running current. This protection is provided by thermal overload relays or trips, or sometimes by fusetrons for small motors. The overload relay or trip is usually combined with the starting switch.



Fusetron

Under voltage protection is also desirable for motors of 3 hp and larger. It prevents the motor from burning out if the voltage drops to a dangerously low point. This protection is also combined with some of the magnetic starting switches. These protective devices are much cheaper than rewinding a motor.

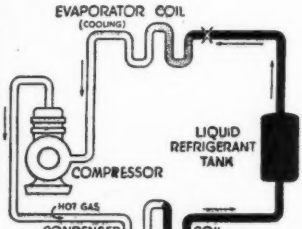
It is essential to have thermal protection on all large motors and on all motors of any size that run automatically. Thermal protection on small shop and utility motors is desirable, not only to save the motor, but to avoid fires that might be caused by overheated motors.

Section 13

Refrigeration and Cold Storage

Refrigeration Principle: Heat Pump

Mechanical refrigeration depends on the properties of certain gases like ammonia (not household ammonia) or freon. When those gases are compressed with a motor driven compressor they get very hot. Cool them with air or water and they will change into liquid. Release them and they will change back again into gas (vaporize) and take up heat in doing so. The accompanying illustration and caption illustrates the process roughly.



Refrigeration or Heat Pump Cycle. Let's start with a tank of liquified freon gas shown at the right. It is under pressure from the compressor. At some point X it is released into coils that make up what is known as an evaporator. In it, the liquid freon changes back into gas. The change to vapor takes up a lot of heat from the pipe and whatever is around it. The pipe gets frosty. Now the compressor takes that gas which is still cold and squeezes it down into a very small space. In compressing it, the gas is made very hot. The hot gas then is forced into a coil called a condenser. Here the gas is cooled either by air or water and again it changes into a liquid.

Now look at the sketch. If you want to cool a refrigerator or a milk cooler or a cold storage house, you put the evaporator coils inside of it. That takes the heat out and dumps it into the kitchen or the milkhouse or outside through the compressor and condenser.

If you want to heat the milkhouse, you keep the compressor and condenser inside and dump the cold outside or into a tank of water by means of the evaporator.

Evaporators

In a large cold storage plant, the evaporator is usually a series of long steel pipes running along the ceiling or side walls. They cool the room. Some cold storage or locker plants use unit coolers instead of pipes. These coolers have many smaller pipes with fans behind them to blow the cold throughout the room. The unit coolers are relatively small. In your refrigerator, your evaporator is a hollow shell of metal surrounding your ice trays or freezing compartment. Or the coils may be fastened to the outside of the inner wall of the box where you do not see them at all.

Refrigerating Machines

Refrigerating machines in sizes from ¾ hp up are available from a number of manufacturers for installation in all types of refrigeration and air conditioning equipment. Installation usually requires the services of an experienced installer. Some milk cooler units are shipped assembled so they may be placed in cabinets and plugged in without a serviceman.

Cold Storage Plants

Hundreds of fruit and vegetable farms have their own cold storage plants. They can cool their crops quickly, grade when not so busy, save the culls, sell when out-of-season prices are higher. The same storage may be used for vegetables and peaches in the summer and apples in the fall.

If the storage has a freezing room, you may add berries, poultry, meats for specialized local and retail trade.

Most manufacturers of refrigeration equipment will give assistance in designing and estimating cold storage plants. The agricultural engineer of your state college may also be able to help.

Freezer Lockers

Freezer lockers containing 25 to 40 lockers and a chill room have been built on a few farms. They serve the farmer and a few close neighbors. Locker rentals pay the cost and operating expenses. Cost around $1800. A possibility for a supplemental farm industry.

Freezers

Freezers are available in sizes from 4 cu ft to any size you want. Some are round, some rectangular. Some are chest models that open on top; some like refrigerators open in front. Some front opening models have several doors, or inside and outside doors; some only one door. Smaller units will pass through a 2' 6" house door. Large ones may have to be assembled inside.

It costs more to operate a freezer at home than to rent a locker of equal size if you count the interest on your investment. Travel back and forth may offset this difference. The home freezer is handy when you need foods, or when you want to save small quantities of home grown produce, left-overs or breads, cakes and pies. It may be economical to use both a home freezer and a locker.

See also Section 5 for *Freezers and Refrigerators.*

Approximate Hours for Freezer to Warm Up from 0° to 24° With Power Off

Amount of Food	16 cu ft Box	30 cu ft Box
Empty	5 hrs	5 hrs
¼ full	15 "	16½ "
½ full	23 "	28 "
2/3 full	29 "	35½ "

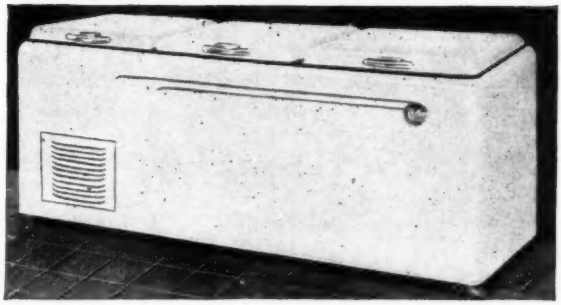
Most foods will start thawing at temperatures below 32°. The 24° in the above table allows for a reasonably safe margin. Outside temp. assumed 80°. Box has 4" of insulation.

Walk-In Refrigerators

Walk-in refrigerators are large size mechanically cooled boxes for general cold storage. They may be used to store milk cooled over a surface cooler. They are commonly used for aging beef. They may also be used for temporary storage of many farm products such as dressed chickens, fruits and vegetables held for a few days for better markets, produce for sale in a roadside stand. Some walk-in boxes contain tanks of brine for circulating through the surface milk cooler; some have frozen food compartments for freezing and storage of produce. Power is ¾ to 1 hp.

Evaporative Coolers

See Section 5.



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Section 14

Shop Equipment

THE time when a farm shop was a corner with a forge, anvil and a few scattered tools and bolts is gone. There's a reason. Each year a little more of the production on farms is done by machinery. That machinery must work when it is needed. Upkeep, repairs, replacements must be looked after.

Farm Shop Plan

The accompanying shop plan is reprinted from our May issue. It names the machines that go into a modern shop, gives good locations for them, and an arrangement for convenience in working on equipment. For instance, the air compressor and welder are located near the doors for convenience in inflating tires, making quick repairs, cleaning the tractor or putting on a final coat of paint. Vise and saw for long material have plenty of room around them. Grinder and drill are in handy spots next to machines being worked on.

Air Compressors

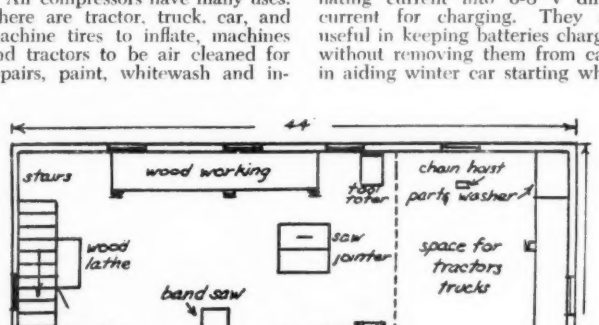
Air compressors have many uses. There are tractor, truck, car, and machine tires to inflate, machines and tractors to be air cleaned for repairs, paint, whitewash and insecticides to be sprayed, modern grease guns to be operated.

Most compressor units can be operated with ¼ hp motors. Some have air storage tanks, some do not. Some compressors are stationary, some may be lifted and hauled, some have wheel carriages. All air compressors should be equipped with blow-off valves, and those with tanks should have pressure gauges. Pressure switches for starting and stopping the motor are desirable.

Never use an old, untested tank for air storage. A tank 16" in diameter and 30" long with 100 lbs pressure has 20 tons of force inside trying to tear it apart.

Battery Chargers

Battery chargers may be of the tube or plate converter type, or small motor generator sets. Manufactured units are of the first types. They are made in small sizes for trickle charging and in larger sizes for regular charging. Homemade units usually consist of a ⅓ or ½ hp motor driving a car generator. The purpose of a charger is to change 115 v alternating current into 6-8 v direct current for charging. They are useful in keeping batteries charged without removing them from cars, in aiding winter car starting when



A PRACTICAL FARM SHOP

batteries are low, and for charging fence controller batteries.

Belts and Pulleys

The power transmitted by belts depends on the width and thickness of the belt and its speed of travel. Most farm motors turn at about 1750 rpm; engines usually at about 450 rpm.

For efficient **flat-belt motor drives,** it is best to run the belts at about 5000 ft per min, using light weight belts no wider than necessary for the power to be transmitted. For example, 3 or 5 in. single-ply belts for 3 to 5 hp motors. Larger pulleys permit use of lighter belts because the belts travel faster.

V belt drives are more satisfactory for small motors. With 1750 rpm motors, a No. 2 belt, 17/32" wide has the following horsepower ratings:

Motor pulley diam	2"	2½"	3"	4"	5"
H P rating	1/12	¼	½	¾	1

The next larger belt, No. 3, 11/16" wide is not recommended for less than 3" pulleys and it is rated at *lower* horsepower until you get up to the 4" pulley size. It is stiffer. These figures are taken from the Gates book on V Belts.

V belts running in V motor pulleys may be used to drive flat pulleys if the driven pulley is several times the diameter of the motor pulley. The closer the two pulleys are together, the less likelihood of slippage on the flat one.

The rule for pulley speeds and sizes is:

Driving pulley diam x its rpm= driven pulley diam x its rpm. If you know three of the factors you can find the fourth. For example: Motor pulley is 3"; rpm 1725. You want the machine to run at 520 rpm. 3 x 1725 equals diam x 520. Or, 3 x 1725 divided by 520 equals 9.9. Use 10" pulley.

Drills

Drills of the types used in garages are also suitable for farm shops. Electric drills are rated in the maximum size of drill they will handle in drilling steel. Most of the portable drills have stands available for mounting them as bench drills. Half inch drills will ordinarily handle ¾ in. wood augers, 2½ in. hole saws, wire brushes and abrasive pads or buffers for cleaning or polishing cars. They are good pieces of equipment for the farm shop. Quarter

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inch drills are light and handy for lighter jobs.

Hand operated **post drills** may be adapted to driving with ¼ hp motors by having the fly-wheel machined to take a V belt, or attaching a V pulley to the fly-wheel.

Forge

Where a forge is used, it is possible to equip it with a small electric blower. The air delivery may be regulated either by motor speed or by a slide valve.

Grinders

Grindstones and small emery wheels may be driven by ¼ hp motors. Heavy duty grinders for plow sharpening, grinding welds, or for wire-brushing, call for ½ to 1 hp motors.

Grindstones of 24 to 30 in. diameter should be run at 65 to 50 rpm. Higher speeds will throw off water.

The surface speeds of emery wheels should be 4000 to 6000 ft per min. At 5000 ft a 4 in. stone should run at 4775 rpm; a 5 in. stone, 3820 rpm; 6 in., 3180 rpm; 8 in., 2387 rpm; and 10 in., 1910 rpm.

Motor driven grinders are available in a variety of styles. Some have attachments for holding sickles, discs and tools for grinding. Special holders are made for grinding twist drills.

Lathes

Where much machinery is used, a metal-working lathe may easily earn its cost in a farm shop. An increasing number are being used on farms.

Wood lathes are of interest to the boys. They may be used in supplemental farm industries, making tool handles, etc.

Portable Motor

There are many jobs that a ¼, ⅓ or ½ hp motor can do in the shop and about the farm. To make it easier to use, equip it with a handle and rocker base.

The two frame bolts at the top of the motor may be loosened and wires fastened under them to make a handle. A 6 in. piece of hose or a wood handle over the wire makes it easier to carry. The rocker base is made of pieces of fork handle, broomstick or ½ in. pipe bolted crosswise to the motor base. These rockers must extend out beyond the motor pulley to keep the motor from twisting. Wherever the motor is to be used, nail down two square guide strips at the right distance for the belt used. Place one of the rockers between these strips. The motor should be tipped up to keep the belt tight.

Paint Sprayers

These help one to do a quick and easy job of painting. Good for touch-up or large areas. Different sizes available.

Speed Reducers

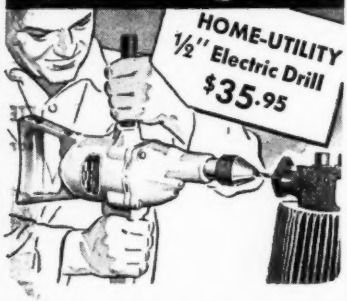
Speed reducers of the gear type and jack-shaft type are made by several manufacturers. They reduce the 1725 rpm motor speed in different steps down to 60 rpm. One reducer gets down to 4 rpm. Some are adjustable to fit machines of different heights.

Saws: Band, Bench, Hand and Hack

Electric saws suitable for farm building and repair operations are of three or possibly four types.

Small **table saws** to be used on a bench serve many purposes. An 8 in. saw will handle about 2¼ in. material. Such saws are usually equipped with safety guards, miter gauges and adjustable table tops or saws. They are good for cabinet work, hens nests, repairs, and may

Speeds Up Farm Repairs



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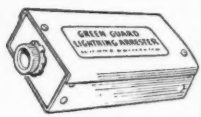

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be used for sawing long boards if support frames are built.

Table saws with large tables and frames that stand on the floor are used on many farms. They are general purpose saws. Such tables with adjustable saws, and supports for the motor under the table are available from manufacturers. One has an adjustable saw driven through a flexible shaft. Many of these table saws have also been improvised in the farm shop. Some combine a saw with a tool grinder. Table saws are usually driven by motors of ½ hp.

Circular hand saws weighing 15 to 20 lbs. with capacities of 1⅞ to 2¾ in. material are being used increasingly where much sawing is to be done. They have special blades for cross-cutting, ripping and mitering. Some have tilting bases for bevel cuts and some have frames for using the saw as a stationary table unit.

Bench **saw speeds** should be 10,000 ft per min, or for an 8 in. saw, 4780 rpm; 10 in. 3820 rpm; 12 in. 3180 rpm.

Band saws are useful for special sawing jobs. They are available in ½ hp sizes.

Power Hack saws are becoming increasingly popular where much welding and repairing is done. They save a lot of labor. Some have been factory made, some homemade.

Welders

Electric welders serve three main purposes on the farm. 1. They permit making quick repairs, with or without taking down the disabled machine. 2. They enable farmers to reinforce machines to do special jobs. 3. They make possible the construction of machines not otherwise available, or the building of attachments for existing machines.

Welders are undesirable equipment on farm lines from the standpoint of the power supplier. They require heavy service wires and transformers and may interfere with voltage regulation. To reduce the line and service difficulties, welder manufacturers have cooperated with power suppliers in adopting specifications for 130 and 180 ampere Farm Welders of the transformer type. These welders will do a good job of welding, brazing and soldering. Most of them may be used on 3 kva transformers, and many power companies now permit their use without any extra service charge. Welders which have a heavier current demand than these NEMA Farm Welders, and particularly those

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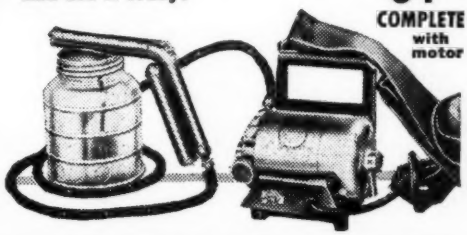

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used for setting up competitive welding shops, usually must pay a special service charge. Many companies are now making welders especially for farm use. With the new coated electrodes available, they are suitable for all farm repair jobs. The price is also lower than for other types.

Brazing and soldering may be done nicely with farm welders using the carbon arc torch for heating. For some jobs, brazing is much easier and just as satisfactory as welding.

To do good welding, you should take a training course. You must devote some time to practicing. Before investing in a welder be sure to discuss it with your power supplier to learn what welders are permitted on the line.

Direct current welders consisting of ac motor driven dc generators have some advantages over transformer type welders for certain types of work. With the improvements in welding rods, however, transformer type welders are outselling dc welders for general repair work. Motor-generator welders may be used on farm lines under the same rules as motors for any other purpose. Most dc welders are made in sizes larger than 5 hp.

Transformer welders are available in 40 to 50 ampere sizes for use on 115 volt circuits. They are **hobby shop welders** but with patience may be used for many repair jobs and for brazing and soldering. Be sure such welders do not draw more than 15 amperes if they are to be used on appliance circuits.

Direct current welders may be made from old lighting plant generators or from Dodge car generators. The generators must be rewired and rebuilt. The resulting equipment is only second rate.

Welders selling for $2.95 to $19.95 and without Underwriter's approval should, in general, be avoided. They have little value as welders and may be dangerous.

Section 15

Water-Irrigation-Water Heating

Farm Water Requirements

	Approx. Gallons per Day
For each member of the family, for all purposes, including kitchen, toilet, bath and laundry	25
Each horse	10
Each cow	15
Each hog	3
Each sheep	1½
Each 100 chickens	4
	Gallons
Filling the ordinary lavatory	1½
For the average bathtub	30
Each shower bath	20-30
Flushing a water closet	6
	Gal. per hr.
½ in. hose with nozzle	200
¾ in. hose with nozzle	275-300
Lawn sprinkler	120

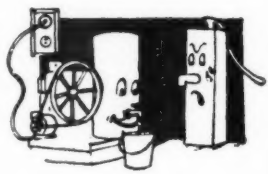
(Water use will vary with different seasons of the year. It will also increase as the water becomes more easily available.)

The capacity of the pump selected should be in excess of the total quantity of water ever to be used at one time. If you are using a ¾ in. hose, the pump should have a capacity of greater than 300 gal per hr or the water would just dribble at the sink or barn. Pumps should run only a few hours per day.

Farm Water Systems

In the city, running water starts at the faucet. Few people know where it comes from or how it gets there.

In the country, and to many pump salesmen, running water means a well and a water system.



If the water is hard, or contaminated, it may also mean a treatment plant. That is just the "water works". It should be preceded by an investigation of the adequacy and purity of the available supply. State Health Departments of State Colleges frequently make free analyses of farm water samples. Then you should estimate the water needed to supply stock, poultry, milkhouse, garden, kitchen sink, laundry, bath room and other needs. Remember when estimating that when you have an *automatic water system*, you will use more than when you pump and carry. And you will use more five years from now than you will now.

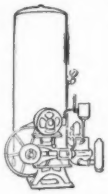
Do not buy a water system until you know what your farm needs will be and what your well will supply.

A water system usually consists of a pump and motor, a pressure tank with pressure control switch

and some means for maintaining an air supply cushion in the tank.

Water Tank Size

A 40 gallon pressure tank operating at 20 to 40 pounds pressure will supply only 6 to 10 gallons of water before the pump starts, and a maximum of only 14 gallons when the current is off. Other size pressure tanks supply in the same proportion.



A 40 gallon tank is commonly supplied. It keeps the pump from starting and stopping every time water is drawn. For emergency storage, large tanks should be used. A 500 gallon tank will supply about 175 gallons. All water systems may be provided with fresh water valves which will supply water direct from the well for drinking purposes.

If your water supply is small, you should use a large storage tank with a small capacity pump to provide for heavy, short period demands. You may also use a gravity storage tank on a tower or in the barn or attic for a reserve supply in combination with a smaller pressure tank.

Fire Protection

There are several things to remember in connection with water systems to make them effective in fighting fire. Water pipes and hose must be large enough so your pressure will not be lost in pipe and hose friction. Hydrants and hose should always be handy where fires are most likely to start. Have your electric pump on a separate circuit and keep the wiring away from locations where the electricity is likely to be cut-off in case of fire.

Types of Pumps

Pumps are made for shallow wells and for deep wells. A shallow well is one where the lift (vertical distance from the water in the well to the pump valves after the pump has been running for some time) is under 22 feet.

Shallow well reciprocating pumps are small, inexpensive, easy to repair and quite efficient. Very satisfactory for shallow wells. Pump need not be over the well.

Turbine pumps have only one moving part. They are simple in construction and quiet running. Good

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A barn and 7,000 chickens burned when a frightened owl flew into a lighted lamp bulb.
The hot lamp filament ignited the accumulated dust particles.
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For convenient replacement, glass globe is standard wide mouth fruit jar. The fixture is completely insulated, with no exposed metal parts. Fits 3¼" or 4" outlet boxes.
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where water does not contain sand. Efficient. Used on shallow wells.

Centrifugal pumps are simple and rugged in construction and low in cost. They are suitable for handling large quantities of clean or dirty water under low heads or in combination with jets for higher heads. Has only one moving part. Used widely for irrigation, for pumping into open tanks, for sump pumps.

Deep well pumps consist of a cylinder below the water in the well operated by rods from a working head placed at the top of the well. They are the most efficient pumps to use for lifts of 100 ft. and more. Somewhat more laborious to install and repair than other types and higher in first cost.

Ejector or Jet pumps combine a shallow well pump with an ejector or jet which serves to boost the water in the well up to within reach of the suction of the shallow well unit. The pumps, originally intended for lifts between about 22 ft. and 100 ft. have now been adapted also for shallow well use. In the latter case the jet is in the pump itself. For deep well use, the jet is placed in the bottom of the well. The pump does not need to be placed over the well. The efficiency of jet pumps drops off with increasing lift, so they are seldom used for lifts of over 100 ft. Ten years ago jet pumps were new. There are now more jet pumps sold than all other types combined.

Rotary or Gear Pumps have few moving parts. They have good suction lift and discharge against pressure. They are used more for oils, gasoline, etc than for water systems. Several small general-purpose rotary pumps are now made with synthetic rubber rotors. They provide a squeeze as well as eccentric pumping action. Inexpensive, and rotors can be easily replaced.

Sump pumps are used primarily in cellars that have no drains. They are small, low-cost centrifugal pumps which rest on the bottom of a sump and are driven by a direct connected motor on a long shaft reaching above the water. Water is discharged at the surface. Usually use ¾ hp motors and are started and stopped by a float valve.

Cost of Pumping

The power used in supplying running water varies with the depth of well, amount of water used, lift, pressure, type of pump. The average is 20 to 25 kw-hr per month. The cost is usually less than 5c per 1000 gallons.

Water Pipe

Wrought iron pipe has been standard for many years. For water systems it should be galvanized inside and outside. The accompanying table gives the pressure in feet of head lost in pipes of different sizes after it has been in use for a number of years. Note that the nominal pipe diameters are neither the inside nor outside diameters. For instance, the actual inside diameter of ⅜" pipe is nearly ½"; of 3" pipe is just slightly over 3".

Friction of Water in Iron Pipe

Flow Gal. per Min	Nominal Diameter of Pipe								
	⅜"	½"	¾"	1"	1¼"	1½"	2"	2½"	3"
	Head Loss—Feet per 100 Feet Pipe								
1	6.4	2.1							
2	23.3	7.4	1.9						
3	49.0	15.8	4.1	1.26					
4	84.0	27.0	7.0	2.14	0.57	0.26			
5	126.0	41.0	10.5	3.25	0.84	0.40			
10		147.0	38.0	11.7	3.05	1.43	0.50	0.17	0.07
15			80.0	25.0	6.50	3.0	1.08	0.36	0.15
20			136.0	42.0	11.10	5.2	1.82	0.61	0.25
25				64.0	16.6	7.8	2.73	0.92	0.38
30				89.0	23.5	11.0	3.84	1.29	0.54
35				119.0	31.2	14.7	5.1	1.72	0.75
40				152.0	40.0	18.8	6.6	2.20	0.91
45					50.0	23.2	8.2	2.80	1.15
50					60.0	28.4	9.9	3.32	1.38
70					113.0	53.0	18.4	6.20	2.57
75						60.0	20.9	7.1	3.00
100						102	35.8	12.0	4.96
120						143	50.0	16.8	7.0
125							54.0	18.2	7.6
150							76.0	25.5	10.5
175							102	33.8	14.0
200							129	43.1	17.8

The above table is based on wrought iron pipe that has been in use for 15 years. For friction in new pipe, multiply losses by 0.7. To change feet of head to pounds pressure, multiply by 0.43.

Copper Tubing

With the shortage of steel, copper has become increasingly popular. It has some advantages in its own right. It will not rust. It is slow to corrode. It is easy to install. For hot water piping, thin walled copper tube saves much heat, normally wasted, in heating the delivery pipe. This is because there is less metal to heat.

There are several kinds of copper and brass pipe. Some is of standard weight and is threaded. Some corrodes easily in certain waters. **Copper tubing** is thin walled and quite different from standard pipe.

Copper tubing is made in two weights and in hard temper tube and soft temper tube. Type K is the heavier and should be used for underground services. Type L is for ordinary interior plumbing. In sizes up to 1¼" it will stand pressures of over 400 lbs per sq in.

Soft tempered tubes feed more easily into walls and bend around

DeLuxe $19.95
Standard $16.95
Use with crock or Gem Dandy jar, sold separately.
3-gal. $2.75,
5-gal. $3.50.

Churn your own fresh, wholesome, delicious butter with Gem Dandy Electric Churn. No drudgery—just flip the switch. Pays for itself over and over again. A million satisfied owners Stop wasting money... buy a Gem Dandy Electric Churn today. Sold by electrical appliance and hardware dealers.

Prices slightly higher west of the Rockies.

GEM DANDY
ELECTRIC CHURN
REG. U.S. PATENT OFFICE

If your dealer can't supply, mail coupon for free, descriptive booklet.

Alabama Manufacturing Company,
Department A-77, Birmingham 1, Alabama.
Send booklet describing Gem Dandy Electric Churn.

*Name*_____

*Address*_____

*Dealer's Name*_____

Approximate Delivery of Copper Tube in U S Gallons per Minute

Pressure Drop per 100 feet in lbs.	⅜"	½"	⅝"	¾"	1"	1¼"	1½"	2"
5	0.7	2	3	5	11	20	35	75
10	1.0	3	5	7	17	30	50	110
20	2.0	4	7	11	25	45	75	165
30	2.5	5	9	14	30	60	95	200
40	2.7	6	11	17	35	70	115	250
50	3.0	7	13	20	40	80	130	280

obstacles. Hard tempered tubes should be used for straight runs without sag. All joints between pipe and fittings are soldered. Screw fittings are also available for water system connections, etc. The table gives the amount of water carried by tubes of different sizes. The sizes given are not actual inside or outside diameters. The outside diameter is about ⅛" larger than the nominal diameter.

Keeping Pipes from Freezing

Many thousands of feet of **soil heating cable** of both the lead covered and plastic covered types have been used to keep pipes from freezing in poultry houses and other exposed places. Last year a **plastic insulated heating tape** especially for use on pipes was put on the market. It contains a complete circuit and may be plugged into a convenience outlet at one end. Cables and tapes may both be controlled by thermostats which turn on the current when the temperature drops. Soil heating cable should always be used in the lengths and according to instructions furnished by manufacturers. If you cut the cable too short, it could get dangerously hot. Minimum lengths to use are 60' on 110 v and 120' on 220 v.

Frost-Proof Hydrants

These hydrants have been very popular with our readers. They provide running water out of doors in the winter time with an arrangement for the hydrant to drain below frostline before it freezes.

Water Warmers for Livestock

Poultry water warmers are of several types. The immersion type is placed directly in the water. It has a heating element of about 150 watts controlled by a thermostat to hold the water at about 50°.

Small hot-plates on which fountains may be placed have just the right wattage to keep the fountain from freezing.

Some poultrymen use soil heating cable placed in the bottoms of long V shaped water troughs and covered with hot asphalt. Others enclose a section under the water pans and place a lamp in the enclosure.

Livestock water warmers are of several kinds. Thermostatically controlled **cast iron heaters** suitable for placing in stock tanks have been used successfully for a number of years. They may be placed in open bottom barrels in the tanks to conserve electricity. They are rugged in construction. 1000 watt.

A heater called the **De-Icer** was placed on the market several years ago. It floats on the water in the tank. It makes no attempt to heat the water but it does keep the ice from forming in a small area where the stock can drink. 300 watt; cost about $20.

A thermostatically controlled, electrically heated **drinking cup** is the newest development. It is like a drinking cup in a dairy barn, but is housed in a metal cylinder 12 in. in diameter and 4 ft long. It is for outdoor use and may be buried at the right depth for cows, sheep or hogs. One cup will care for 10 or more cows.

A **freezeless stock tank** has been devised by a Minnesota farmer. By using a small shallow tank and keeping a small quantity of pumped water flowing through it, the tank does not freeze. It is not the motion of the water that prevents freezing, but the heat units brought in with it. He figures that 1 kw-hr will pump about 1000 gallons of water from the average well. If the temperature of the water is down as low as 42°, that 1 kw-hr will put about 75,000 ice-melting

NO MORE FROZEN WATER PIPES!

Thermotape

The Wonder ANTI-FREEZE TAPE

AUTOMATIC—EFFECTIVE—ECONOMICAL

Simple, Easy-to-use, Low-Cost protection against frozen water pipes, eaves troughs, etc. Thoroughly proven, Dependable, Guaranteed. Simply attach to pipe with friction tape and plug in to 110 volt AC—instantly its heat starts working. Control automatically with Tapestat or Temstat. (Excellent also for soil heating in hot beds.) 14 ft. (100 watts) $3.40; 20 ft. (140 watts) $3.75; 40 ft. (280 watts) $6.95. Fixed Temp. Control—Tapestat $3.95. Adjustable Temp. Control—Temstat $6.75.

HOT WATER

where needed by the Pailfull, heated and held at 130°—for managed milking, or semi-scalding poultry.
NMH 5001130—500 watts **$13.65** Fed. Tax Incl.
PWH1000130—1000watts **$13.65** Fed. Tax Incl.
For Egg Washing or other uses where 160° water is required.
PWH1000160—1000watts **$13.65** Fed. Tax Incl.

STOCK TANK NO-FREEZE

keeps water in exposed drinking tanks drinkable during coldest weather. Easy to use—it Floats—just plug into 110 Volt, A.C. Safe—Economical—Built to give years of service.
FWW 50040—(500 watts)—**$9.45** Fed. Tax Incl.

At your dealer's—or write for information to

THE SMITH-GATES CORP., P. O. Box 152, PLAINVILLE, CONN.

SATISFACTION SG GUARANTEED

SMITH-GATES

AIDS TO PROGRESSIVE FARMING, Better Living

heat units into the tank. A good well and good drainage would be necessary.

Shower Cabinets

Metal shower cabinets are becoming increasingly popular. They come complete with shower fixtures and drain. They may be installed in closets, ends of halls, pantries, porches, shops or sheds not originally intended for bath rooms.

GENEROUS • LIVELY • SPARKLING

RUNNING WATER at LOWEST COST

with an APCO Master-Line WATER SYSTEM (SHALLOW WELL)

WRITE for BULLETIN 112-A

You make an investment in better living and greater farm profits when you install an APCO Master-Line Unit. Operating at slow speeds (1750 R.P.M.) and with only one moving part in the pump, you are set for many years of superb water service—enough for EVERY farm need including FIRE PROTECTION. 325 G.P.H. (others up to 3000 G.P.H.) Silent operation. Instant response. Life-Time replaceable pump covers. SATISFACTION GUARANTEED.

We Also Make Deep Well Pumps

DISTRIBUTORS IN PRINCIPAL CITIES

AURORA Always PUMPS — AURORA PUMP COMPANY

88 Loucks St., AURORA, ILLINOIS

Fluorescent Fixture with CIRCLE LAMP

GUARANTEED FOR 1 YEAR!

A strikingly beautiful fixture in polished aluminum finish. Suitable for every room. Model C-32AP (illustrated), $9.75. Model C-32S with etched design glass shade, $12. Cash or C.O.D. Direct from factory. Send for literature. Write HANOVER LIGHTING SALES, Box 180, Hanover, Pennsylvania. Dept. E.F.

9.75 F.O.B FACTORY

Water Treatment

A number of companies make water softeners to be used in connection with water systems where the water is hard. These softeners use a tank of zeolite, an inert chemical, to precipitate out the lime. The zeolite is regenerated by washing it with common salt brine. Some of the systems are almost automatic in operation. Soft water saves soap and labor, and makes dish and clothes washing easier.

Other foreign matter such as iron may be removed from water by special treating processes. Before installing water treatment equipment, samples of water should be sent to the manufacturer for test.

Small Chlorinators

Where it is impossible to get a supply of pure germ-free water, as in many cities, the water is made safe by dosing it with chlorine. Recently a small chlorinator has been put on the market. It is automatic and designed especially for farm water supplies.

Irrigation

Irrigation pumps are generally of the centrifugal or turbine type. These turbine pumps are quite different in design from the turbines used for shallow well water systems. They are improved, multi-stage centrifugals used for pumping large quantities of water against high heads or from deep wells. Some of them are as small as 6 in. in diameter and go down inside a well casing. They are driven through shafts by direct connected motors, usually at the ground surface.

Ordinary single stage centrifugal pumps are good for total heads of about 70 feet. If the lift is more than 70 feet, two or more pumps (stages) are coupled together to produce the higher pressure.

A rough estimate of the number of gallons per minute discharged by a single stage centrifugal pump is ½ the diameter of the discharge in inches squared and multiplied by 100. For example: A 4" pump discharges 2 x 2 x 100=400 gal per min. A 6" pump discharges 3 x 3 x 100=900 gal per min.

Where irrigation pumps are used quite continuously for 3 to 6 months of the year, as in arid regions, it is important to get highly efficient pumps to keep down pumping costs. High speed, multi-stage centrifugals are very efficient. In the East where the pumps may be used for only a week or two for supplemental irrigation, less costly pumps may answer the purpose.

For sprinkler irrigation, centrifugals, turbines or reciprocating pumps may be used depending on the head or pressure to be pumped against.

Fish Fence

Where water from ponds or streams is used for irrigation, there sometimes is quite a loss of fish in the irrigation ditches. An electric screen is available for keeping them out of the ditches.

Water Heating

The choice of size of a water heater depends upon the amount of hot water used, the distribution of use during the day and the electric rate for water heating. Water heater tanks used on a continuous current metered rate or flat rate may be somewhat smaller than those used on off-peak rates. (See Sect. 4) The off-peak rate is a special rate granted for current used at night or when the demand is low. The water heater is so wired that it cannot use electricity at other times. Under these conditions it is necessary to heat and store the water for later use. If a 30 to 50 gal tank would do for continuous heating, a 50 to 80 gallon size might be needed for off-peak heating. No farm should have less than a 30 gallon heater. Most should have 50 to 100 gallon sizes.

Types of Water Heaters

Pressure heaters are made in tank sizes of 2 gallons to 100 gallons or larger. The water is piped into the tank from the water system under pressure. Tanks are insulated. Heaters are placed near the bottom of the tank. There may also be one near the top for heating a small quantity of water quickly. Hot water is drawn from the top of the tank. The bottom heater may be on off-peak wiring and the top one on the metered rate. These heaters may be round or square, tall or short. They are used in the home and are also suitable for the milk house. They are equipped with heating elements of 1 to 4 kilowatts.

ASK YOUR DOCTOR

About the dangers of drinking raw milk.

It may cause such milk-borne diseases as Undulant Fever (Brucellosis) resulting from Bang's disease, Typhoid Fever, Scarlet Fever, etc. The only certain way to make milk safe is to pasteurize it.

WATERS CONLEY HOME PASTEURIZER

Handy one-gallon size. Entirely automatic. Assures positive pasteurization. Operates on 110 AC current. See your dealer or write for free folder:

WATERS CONLEY CO.
Dept. E Rochester, Minn.

BLIZZARD
ENSILAGE CUTTER – HAY CHOPPER

EASILY OPERATED WITH 5 H.P. Motor! Economical—at Michigan State College filled 4 silos at electric power cost of less than 3¢ per ton! 15 Exclusive features include "streamline" direct delivery. Direct drive available (picture below)—Free Catalog at your dealer's or write.

BLIZZARD MFG. CO. Canton, Ohio

SMALLEY HATCHET MILL No. 5

Grinds and chops feed or roughage faster than hammer mill. Twin slicer knives, plus hammers. Takes less power. Safe pneumatic feed. WRITE — SMALLEY MFG. CO. 535 York St. Manitowoc, Wisconsin

FOR 5 H.P. ELECTRIC MOTORS

Pour-in heaters are made so that to get out a gallon of hot water, you must pour in a gallon of cold water. The cold water is baffled to stay at the bottom of the tank. These have become very popular. There is little danger of burning out heating elements. They are not under pressure. Common size is 10 gallons.

Open-top heaters are made for milk house use. They come in sizes of about 3 to 10 gallons. You take off a lid; pour in the water from a bucket or faucet. When the water is heated, it is drawn from a faucet at the bottom of the tank. Advantage: The last water drawn is as hot as the first. Disadvantage: The heating element may burn out if water gets low.

Pail heaters provide about 3 gallons of hot water. The heating element of one make is fastened to the wall. When a pail of water is hung on the heater frame with the immersion heater extending into the water, the electricity is turned on. When the pail is lifted off, the heat is turned off. Another has a thermostat controlled heater in the bottom of the pail.

Immersion heaters approved by the Underwriter's Laboratories are available from a few manufacturers. One is a 1300 watt heater that may be immersed in a milk can or pail. A new 500 watt unit heats water to 130° for massaging cows' udders. They should not be used in direct contact with milk or mash.

Some cheap immersion heaters having electrical contacts exposed to the water have been on the market at $3 to $8. They do not have Underwriter's approval and are definitely dangerous pieces of equipment to use. Avoid them.

Instantaneous water heaters are devices which clamp to or take the place of a water faucet. When the water is turned on, the electricity turns on with it. The water heats as it flows out. Impractical for most farm lines. They make sudden demands for as much electricity as 5 or 10 hp motors.

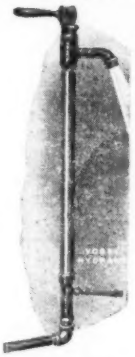
Hot plates of the heavy duty type may be used to advantage for water heating where only small quantities are needed.

Steam accumulators (see Section 7) when used for sterilizing utensils may also be used to provide hot water.

VOGEL PRODUCTS *For Farm Use*

★ ★ ★

Running Water All Year 'Round With Vogel Frost-Proof Hydrants



★ Will never freeze when properly installed

★ Reduces fire hazard

★ Over a Million Vogel Frost-Proof Closets and Hydrants have been sold.

Farmers like the Vogel Hydrant because it never fools them. When they see the handle in an upright position they know the water is surely shut off. Any hydrant that does not positively close, may waste water in summer, and is sure to freeze up in winter.

★ ★ ★

VOGEL NO. 4 *Frost-Proof Closet*

A sturdy dependable frost-proof closet, ideal for farm use. Has heavy brass valves, hardwood seat, twelve gauge steel tank with white enamel finish and a vitreous china bowl so constructed that it will not freeze even at sub-zero temperatures.

JOSEPH A. VOGEL CO.
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Please send full information regarding Frost-Proof Closets and Hydrants.

Name.....
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McDowell Patented Irrigation
COUPLINGS AND FITTINGS
Faster to move, quicker and safer to couple, adaptable for Giant Sprinkler Mounts or standard systems from 2" to 6"

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NEW! MONEY-SAVING Electric HOME CLIPPER
FOR EVERY MEMBER OF THE FAMILY: Save big money on family haircuts! New electric clipper, with special tapering comb, enables anyone to give professional type haircuts at home! Pays for itself in 15 haircuts! Safely trims legs and under arms with razor closeness. Guaranteed. You take no chances — your money refunded if not fully satisfied. Only $12.50

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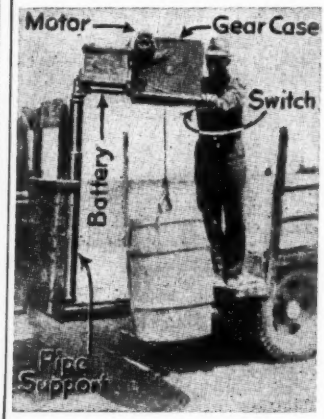
BELLE CITY APPLIANCE CO.
RACINE, WISCONSIN

Fruit, Flower and Vegetable Production

Barrel Loader

In Aroostook county, Maine, where potatoes are hauled from the fields in barrels, an electric barrelloader is being used effectively. It is located at the front



corner of the truck body just behind the cab. Power is furnished by a 6 volt storage battery and a Ford starter motor. The hoist is on a swinging arm so the barrel can be swung over and lowered on the truck platform. A battery charger keeps the battery primed.

Cold Storage

See Section 13.

Conveyors

See Section 7.

Cutting Benches; Germinating Benches

Soil heating cable placed on the bottom of benches provides warm soil and cool air which has been found advantageous in inducing root growth in starting cuttings. Similar benches are used for producing seedling plants in greenhouses.

Dehydrators

Dehydrators are common farm equipment where certain crops are grown. Most of the prune crop of the Pacific Coast is dehydrated.

Fruit and vegetable dehydrators usually consist of tunnels 20 to 40 ft long, 4 to 6 ft high and 3 to 4 ft wide. The prunes or other products are pretreated and placed on shallow, screen-bottom trays on slides or low trucks, on which they are moved through the tunnels. Air at about 165° is blown through and between the trays by large electric fans. Wood or other fuel is used for heating the air.

Conveyors, washers, elevators and water systems are part of the equipment of most dehydrators. The connected electrical load may vary from 10 to 40 hp. A farm or community dehydrator will cost from $10,000 to $30,000.

Hop driers have been the subject of much experimental work in the Northwest. Many natural-draft driers have been changed to forced air types. Generally, hops are dried on "floors." These floors are made of slats about 1 in. wide on edge with 1 in. spaces between. They are covered with coarse burlap. The floor is 8 ft up from the ground in a building 30 ft square and with a hot air furnace beneath the floor. The hops are spread very carefully to a depth of 30 in. over the floor. The walls and roof above the "floor" are sealed and the warm air is drawn up through the hops by an exhaust fan in a cupola at the top and center.

English walnut dehydrators may be of the bin or tunnel type. The principles involved are similar to those of prune and hop dehydrators.

Fruit and Potato Graders

Motor driven graders are standard equipment wherever apples or potatoes are marketed by grade or size. They are operated by fractional horsepower motors. The grading is done either according to weight or diameter. Usually graders are combined with conveyors and washers or other cleaning equipment.

Fruit Washers

The Government prescribes limits of the amount of poison sprays which may be permitted to remain on sprayed fruit. Usually this

KEEP FOOD Fresh FOR DAYS LONGER

Now—with "Pollene" plastic refrigerator bags you can keep vegetables, meat, fish, fowl fresh for days—keeps bread and pastries fresh for days longer. REAL FOOD SAVERS! Wonderful for fish and cheese. "Pollene" bags are made of heavy pliable, practically indestructible plastic sheets, waterproof, acid proof, heat and cold resistant, easily washed and useable indefinitely. Will save their cost first time used! Simply fold over end of bag to seal.

Order as many sets as you want for your own use or as gifts. Ask prices in quantities of bags on liberal dealer discounts.

OUR INTRODUCTORY OFFER

Size	Quantity	Use
18" x 21"	1	Turkeys, roasts, pastries
12" x 18"	1	Fruit and vegetables
9" x 13"	2	Cheese, fish
9" x 26"	1	Celery, bread
8" x 10"	2	Dough, cold-cuts

FOR QUICK FREEZER USE

any of the above sizes can be had in quantities at substantial savings.

Money back guarantee. No C.O.D. Orders.

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ORDER TODAY Pollene FREEZER BAGS 7 BAGS FOR $1 Postpaid

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Send me, mail prepaid,.....sets at $1.00 per set. (We will mail gift sets to anyone you say).

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☐ Check here if you want prices on quantities.

NO FROZEN PIPES
TRADE MARK

Frozen Pipes cause big losses. Wrap heating cable around pipe or lay alongside in soil. Should outlast the pipe. Uses little house current. Thousands of satisfied customers. Ppd. with instructions or from your dealer.

B12	30 w.	for 2 to 5 ft. pipe		$1.80
M26	60 w.	" 5 " 12 "	"	2.80
J56	140 w.	" 12 " 25 "	"	3.00
S112	280 w.	" 25 " 50 "	"	6.00
HDA Thermostat 35°-80° with pilot lt.				6.00

GRO-QUICK 370 W. Huron St., Chicago 10, Ill.

COPPER TUBING
BRASS FITTINGS

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9048 W. Michigan Ave. Marshall, Mich.

means washing the fruit to remove the spray residue. Washers use electrically heated solutions and mechanical agitation or brushing of the fruit. The fruit is then dried by means of motor driven wipers and fans. The operation may take 5 to 10 kw in heaters and up to several horsepower in motors.

Frost Prevention

California citrus producers have installed some **air propellers** as substitutes for smudge pots for frost prevention. Large motor-driven propellers are mounted on towers

40 to 50 ft high. They are driven by motors as large as 50 hp. The coldest air is closest to the ground. The propellers draw the warmer air from layers just above the trees and mix it with the cooler air. Where a degree or so will protect, these wind producers are said to handle as much as 30 acres each.

Infra-red rays have been used experimentally in California and Michigan for frost protection. They can be made effective, but so far the cost has been prohibitive.

Greenhouse Heating

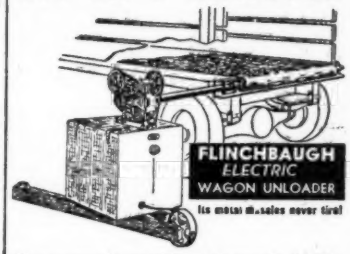
On the West Coast, electric heat in greenhouses has been used for many years. Experimental work was done with heaters placed under the benches. Plant houses and small greenhouses are now heated with a combination of soil heating cable in benches and unit electric heaters (fan type) for tempering the air above the benches.

Hotbeds

Soil heating cable made of insulated heating wire covered with a lead sheath heats the soil. The cable is used in 60 ft lengths. It generates about 400 watts of heat on a 115 volt circuit. On 230 volt circuits, 120 ft produces 800 watts. Sixty feet of cable is commonly used to heat 36 sq ft of bed. The

WAGON UNLOADER

UP TO 6 TONS—
OFF IN 7 MINUTES



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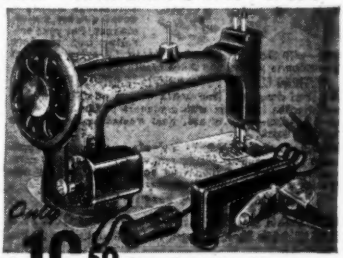
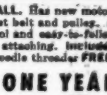
Don't spend $200 or more
ELECTRIFY your OLD
SEWING MACHINE
THE "AMERICAN WAY"



Only $16.50 complete EASY TO INSTALL. Has new motor, mounting bracket belt and pulley, 6-speed foot control and easy-to-follow instructions for attaching. Included with each kit—needle threader FREE.

GUARANTEED FOR ONE YEAR

Sewlight $2.00 extra, if desired. Special price with kit only. Sewlight alone $3.00.



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ADDRESS.....
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☐ Check Enclosed ☐ C.O.D.

SpeedWay
No. 89-J—same drill as "89" but with Jacobs Key-operated Chuck.
$34.95
No. 89—Light Duty ½" Electric Drill with Snap Action Chuck.
$29.95
No. 209 drill) Stand (less drill)
$12.95

LIGHT Duty ½" drills are designed for intermittent duty. Lighter, handier and less costly than heavy production type drills, designed for continuous factory operation, these SpeedWay Drills are ideal for farms, garages, general construction and repair use. Specially wound, long life, fan cooled SpeedWay tool motor. Sturdy die cast aluminum case. Cut steel gears. Self-lubricating bearings. With No. 209 Drill Stand makes capable drill press.

Sold by leading hardware and implement dealers.

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WIRING! AMP ELECTRICAL REPAIR KIT

Solderless Wiring— Does it quicker, easier, cheaper. Put your soldering iron in moth balls—with the AMP Electrical Repair Kit every electrical connection is perfect and takes 1/10th the time.

NOTHING ELSE TO BUY—COMPLETE KIT ONLY $5.95

The tool does all the work— cuts wire, strips wire, and attaches terminals with a squeeze of the hand. Insulated handles—easy to use. Heat treated jaws—corrosion resistant finish.

100 Assorted AMP Terminals— As good for appliances and household wiring repairs as it is for your cars trucks, tractors and motorized equipment. Used by mechanics and service men from coast to coast.

Only $5.95 complete. Send cash, or check to

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PASTEURIZE with the **SAFGARD** Home Milk Pasteurizer

The Only Complete Home Pasteurizer

- Twin Agitation
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2-gallon capacity; 110-Volt AC Operation

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1501 S. Laflin Street, Chicago 8, Illinois

temperature is controlled by a **soil thermostat.** The cable may be placed either on the soil surface or six inches beneath the surface. Sixty feet of cable costs about $5; thermostats $6 to $15. Power consumption averages about 1 kw-hr per sash (3′ x 6′) per day. Advantages are better control of temperature than with manure, automatic protection on especially cold nights, adjustment of temperature for the particular plants being raised. Lengths shorter than 60 ft on 115v or 120 ft on 230v should not be used. Shortening the cable increases its temperature and may damage the insulation.

A **plastic insulated heating cable** without the lead sheath is also available. It costs less; has been found durable; has different wattage ratings.

The Connecticut Agricultural Experiment Station developed the use of **lamp heated hotbeds.** The lamps are supported above the bed with reflectors to direct the heat downward. While the heat from the lamps is satisfactory, the lamp supporting strips are in the way when working in the bed.

Soil heating cable laid on the ground surface or attached to the sides of a coldframe is good insurance against frost. A thermostat will turn on the heat on frosty nights.

Light Traps for Insect Control

Many insects are attracted by lights. Research work has been conducted by a number of agricultural experiment stations and by growers to determine the kind of lights and kind of electric traps which would bring harmful insects under control. Work with corn borers is being continued by the USDA. To date, results have not warranted the use of the method in orchards or fields. For tomatoes and in gardens, clear glass incandescent lamps have given good results in attracting many insects. The lamps are supported about 6 in. above a broad, shallow pan of water on which there is a film of coal oil.

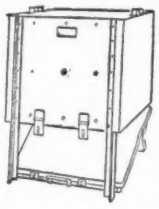
Open Soil Heating

Many years ago tests were run at the Puyallup Experiment Station in Washington on forcing the growth of plants in the open with soil heating cable. The cable was buried just to the side of the row of seeds.

In the past few years a number of farmers have been producing earlier plants by similar methods. They are not as early as when grown in hotbeds, but much earlier than when produced in the open without heat.

Soil Sterilization

Soil is sterilized (or, more correctly, pasteurized) to kill insects, disease spores and germs, and to kill weed seeds. Use of sterilized soil for growing plants protects from wilt and other diseases and saves weeding.



Two designs of sterilizers are available. One is a box holding ½ cu yd of soil and having metal heating elements distributed through the center of the box. It is filled from the top and dumped through a drop door in the bottom.

The other sterilizer is a flat box holding about ¾ cu yd and being divided into sections by vertical metal plates. Current is passed between these plates and the resistance of the soil causes it to heat. It is filled and emptied as above.

The wattage of sterilizers is usually about 3 kw per half cu yd. Power consumption is about 1 to 1½ kw-hrs per cu ft of soil sterilized.

Spray Rigs for Greenhouses

A popular piece of electric equipment for greenhouses is a portable spray rig. Mounted on a sturdy wheelbarrow frame, the compressor is powered by a ¾ hp motor. May be used for plant sprays, whitewashing, etc.

Stationary Spray Plants

Stationary spray pumps and tanks are located at some central point where water is available. The pump is set on a concrete foundation and the spray solutions carried to the orchard in permanent underground pipes.

Installations range from 3 to 30 hp. A 5 hp pump will supply two nozzles (8 to 14 gpm) at pressures up to 600 lbs. Used in many commercial orchards and groves, particularly in the West and in Virginia.

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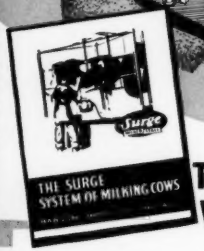

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